2.0 DESCRIPTION OF PROJECT MODIFICATIONS AND COMPARISON TO APPROVED PROJECT

2.1 Introduction

Following certification of the Final EIR by the CPUC (Decision 09-12-044, December 24, 2009) and approval of the Special Use Authorization by the Forest Service (Record of Decision [ROD], October 4, 2010), SCE proceeded with final engineering of the Approved Project prior to initiating consultation with the FAA regarding the new transmission structures to be installed as part of the Approved Project, as required by Mitigation Measure L-2b (*Aircraft flight path and safety provisions and consultations*). Final engineering for a given structure is preferred prior to filing a FAA Form 7460-1 (as required by Mitigation Measure L-2b) as specific information regarding the structure height and location is required. Therefore, upon completion of final engineering, SCE identified the structures and catenaries (wire spans) that met the FAA's reporting thresholds and submitted Form 7460-1 for each. In response, the FAA issued determinations recommending the installation of marker balls on certain transmission line (T/L) spans and aviation lights on certain transmission structures. All determinations from the FAA have been completed. Table 2.1-1 summarizes the FAA's determinations, and includes SCE's best estimate of the number of marker balls required based on FAA guidelines. The 10-page map set (Figures 2.1-1a through 2.1-1j) provided at the end of this section identifies the 276 T/L spans where marker balls are recommended, and the 90 transmission structures where aviation lights are recommended.

Table 2.1-1. Marking and Lighting Requirements by Segment[1,2]

Segment	Location	Transmission Structures for Aviation Lighting	Transmission Line Spans for Marker Balls	Approximate Number of Marker Balls
4	TWRA-Lancaster	TOTAL: 0	TOTAL: 0	TOTAL: 0
5	Lancaster-Palmdale	TOTAL: 11	TOTAL: 26	TOTAL: 186
6	Angeles National Forest	Total (NFS lands): 0 Total (non-NFS lands): 2 TOTAL: 2	Total (NFS lands): 65 Total (non-NFS lands): 13 TOTAL: 78	Total (NFS lands): 571 Total (non-NFS lands): 83 TOTAL: 654
7	Duarte-Irwindale-Baldwin Park-Industry	Total (USACE land): 4 Total (non-USACE land): 20 TOTAL: 24	Total (USACE land): 8 Total (non-USACE land): 29 TOTAL: 37	Total (USACE land): 54 Total (non-USACE land): 199 TOTAL: 253
8	Chino–Chino Hills–Rose Hills–La Habra Heights	Total (USACE land): 5 (8-4) Total (non-USACE land): 39 TOTAL: 44 (Phase 8-1=1; Phase 8-2=12; Phase 8-3=22; Phase 8-4=9)	Total (USACE land): 7 (8-4) Total (non-USACE land): 74 TOTAL: 81 (Phase 8-1=19; Phase 8-4 =62)	Total (USACE land): 23 (8-4) Total (non-USACE land): 606 TOTAL: 629
9	Whirlwind Substation	TOTAL: 0	TOTAL: 0	TOTAL: 0
10	TWRA	TOTAL: 1	TOTAL: 0	TOTAL: 0
11	ANF-Altadena-Pasadena–San Gabriel–Monterey Park	Total (NFS lands): 3 Total (non-NFS lands): 5 TOTAL: 8	Total (NFS lands): 46 Total (non-NFS lands): 8 TOTAL: 54	Total (NFS lands): 458 Total (non-NFS lands): 68 TOTAL: 526
TOTALS		90	276	2,248

Source: SCE, 2012b; SCE, 2013b. Definitions: NFS (National Forest System); USACE (US Army Corps of Engineers).

1 - All determinations from the FAA have been received; all numbers presented are based on the FAA's recommendations and SCE's best estimate of the number of marker balls required based FAA guidelines.

2 - Lights and/or marker balls have already been installed following the FAA's recommendations for those structures and T/L spans constructed prior to receipt of the FAA's recommendations to avoid associated safety issues. Construction was halted by the CPUC on all other structures where FAA recommendations were pending and supplemental analysis is required.

In addition, the FAA expressed concerns that certain structures near the Chino Airport would interfere with the instrument approach procedure; therefore, SCE proposes engineering refinements to 21 structures. These refinements include changing structure types from tubular steel poles (TSPs) to lattice steel towers (LSTs) to reduce the height consistent with FAA recommendations while maintaining required conductor ground clearance. These structures are located in Segment 8, Phase 3 of TRTP between Chino Substation in the City of Chino and Mira Loma Substation in the City of Ontario (Note: Segment 8 is defined in four phases, as follows (from west to east): Phase 4 was previously Segment 8A from the San Gabriel Junction to Diamond Bar; Phase 1 was Segment 8A from Diamond Bar to Central Avenue in Chino; Phase 3 was previously Segment 8A/8C; and Phase 2 was previously Segment 8B).

This section provides a description of the Approved Project, as analyzed in the 2009 Final EIR and 2010 Final EIS (Section 2.2), as well as a description of the proposed modifications to the Approved Project (Section 2.3) (i.e., Modified Project). Where appropriate, information has been updated to reflect the Forest Service ROD, and the approved construction permit. These changes reflect minor refinements of the detailed construction plans, and were made to reflect final engineering data that were not available at the time the Final EIR and Final EIS were published. The description of the proposed modifications covers the basic features, installation, and maintenance of the marker balls and lights, as well as the engineering refinements in Segment 8, Phase 3. This information reflects the best available data subject to further final engineering and evaluation by SCE and appropriate agencies, including but not limited to the CPUC, Forest Service, US Army Corps of Engineers, US Fish and Wildlife Service, and the FAA.

2.2 No Project Modifications/No Action/Approved Project as Analyzed in the 2009 Final EIR and 2010 Final EIS

The Approved Project, which for the purposes of this SEIR/SEIS is the No Project/No Action Alternative, includes new and upgraded transmission infrastructure along approximately 173 miles of new and existing rights-of-way (ROW) from the Tehachapi Wind Resource Area (TWRA) in southern Kern County south through Los Angeles County and the Angeles National Forest (ANF), crossing National Forest System Lands (NFS), and then continuing east to the existing Mira Loma Substation in Ontario, San Bernardino County, California. The major components of Approved Project have been separated into eight distinct segments, as shown in Figure 1.3-1. Under separate application to the CPUC, SCE previously requested approval for Segments 1, 2, and 3 of the Antelope Transmission Project, which would also enhance transmission and related infrastructure serving the TWRA. Consequently, the description of major components for the TRTP begins with Segment 4 and continues to Segment 11. Segments 4 through 8, as well as Segments 10 and 11 of the TRTP are transmission facilities, while Segment 9 addresses the addition and upgrade of substation facilities. The segments begin numerically (not geographically) with Segment 4 (S4) and continue through Segment 11 (S11); however the discussion below has been presented geographically, beginning with the northernmost point located in the TWRA (Segment 10) and ending at the southern/easternmost point in Ontario (Segment 8). Mileages along each segment are denoted first by the segment number (Sx, where x is between 4 and 11), followed by MP (for milepost) and then the mileage.

The major components of the Approved Project, by segment, are summarized in Table 2.2-1. A more detailed description of the segments follows the table. Please also see Chapter 2 of the Final EIR (October 2009) and/or Final EIS (September 2010), and the Forest Service ROD, for detailed descriptions of the Approved Project, which includes a combination of Alternative 2 (SCE's Proposed Project), Alternative 3 (West Lancaster Alternative), Alternative 6 (Maximum Helicopter Construction in the ANF), and Alternative 7 (66-kV Subtransmission).

Table 2.2-1. Summary of Approved Project (Combination of Alternatives 2, 3, 6, and 7) Components

Overall Project Construction

- Proposed construction duration of approximately 59 months (Note: Construction began in April 2010 and is currently expected to be completed in early to mid-2015, pending a decision on undergrounding options within Chino Hills. Construction of Segments 4, 5, and 10 is complete.); however, within Segments 6 and 11, where the need for substantial helicopter construction is required, a longer construction schedule may result due to the limited availability of specialized helicopters and personnel. The schedule for helicopter construction will be adjusted continuously as final engineering and construction progress.
- Transmission facility construction generally scheduled for Monday through Friday, 7:00 a.m. to 5:00 p.m.; however, if extended hours are necessary, such as 24-hour construction, a variance will be acquired
- Substation construction generally scheduled for Monday through Friday, 7:00 a.m. to 5:00 p.m.; however, if extended hours are necessary a variance will be acquired
- Workforce ranging in size from 10 to 300 persons, with daily average workforce of approximately 75 persons

Segment 10: New Whirlwind–Windhub 500-kV T/L

- Initiates at the approved Windhub Substation (not part of Project) and ends at the new Whirlwind Substation
- Construct new approximately 16.8-mile single-circuit Whirlwind–Windhub 500-kV T/L
- All proposed permanent infrastructure to be located within new 330-foot-wide ROW (approx. 16.8 miles)
- Erect approximately 96 new single-circuit 500-kV LSTs (90-200 feet tall)
- Will require approximately 16 new wire setup sites for pulling/tensioner/splicing of conductor wire

Segment 4: Whirlwind 500/220 kV T/L Elements[1]

- Initiates at the proposed Cottonwind Substation (not part of Project) and ends at the existing Antelope Substation
- Construct two new parallel 4.0-mile single-circuit 220-kV T/Ls (Cottonwind–Whirlwind 220-kV No. 1 & No. 2)
- Construct new approximately 16.0-mile single-circuit Vincent–Whirlwind 500-kV T/L
- All proposed permanent infrastructure to be located within new 200-foot-wide ROW (approx. 20.0 miles total)
- Erect approximately 164 new transmission structures, including:
  - 88 single-circuit 220-kV LSTs (73-138 feet tall)
  - 76 single-circuit 500-kV LSTs (113-188 feet tall)
- Will require approximately 28 wire setup sites for pulling/tensioner/splicing of conductor wire

Segment 5: Antelope–Vincent No. 2 500-kV T/L

- Initiates at the existing Antelope Substation and ends at the existing Vincent Substation
- Remove the existing Antelope–Vincent 220-kV T/L and the existing Antelope–Mesa 220-kV T/L
- Construct new approximately 17.4-mile single-circuit Antelope–Vincent No. 2 500-kV T/L
- Most of the proposed permanent infrastructure (with the exception of side board width requirements of the new cutovers) to be located within existing ROW (approx. 17.4 miles)
- Erect approximately 67 new single-circuit 500-kV LSTs (90-193 feet tall)
- Will require approximately 37 wire setup sites for pulling/tensioner/splicing of conductor wire

Segment 11: New Mesa–Vincent (via Gould) 500/220-kV T/L

- Initiates at the existing Vincent Substation and ends at the existing Mesa Substation
- Remove approximately 4 miles of the existing Pardee–Vincent No. 1 220-kV T/L
- Remove approximately 15 miles of the existing Eagle Rock–Pardee 220-kV T/L
- Construct new approximately 18.7-mile 500-kV single-circuit T/L between Vincent and Gould Substations (initially energized at 220 kV)
- Re-route portions of two existing 220-kV lines into Vincent Substation using currently idle towers.
- String approximately 17.5 miles (3.3 miles are located on NFS lands) of new 220-kV conductor on the vacant side of the existing double-circuit structures of the Eagle Rock-Mesa 220-kV T/L (10 existing structures are located on NFS lands)
- Most of the proposed infrastructure will be located within existing ROW
- Erect approximately 76 total new transmission structures (59 LSTs on NFS lands), including:
  - 2 single-circuit 220-kV poles (120 feet tall)
  - 7 single-circuit 220-kV LSTs (120-160 feet tall)
  - 67 single-circuit 500-kV LSTs (100-198 feet tall), of which 17 are configured as delta towers (10 on NFS lands)
- Construction of 36 structures by helicopter (all on NFS lands), supported by 10 helicopter staging areas (6 on NFS lands)
- Will require approximately 35 wire setup sites for pulling/tensioner/splicing of conductor wire (10 on NFS lands)
- The majority of this segment will be located on NFS lands including: S11 MP 1.5-3.5, 3.75-18.5, 19.25-20.3, 20.8-21.3, 21.8-22.6, 23.05-24.15, and 24.35-24.55 (in-holdings or other non-NFS lands are located between the mileposts listed)

Table 2.2-1. Summary of Approved Project (Combination of Alternatives 2, 3, 6, and 7) Components

Segment 6: Section of New Replacement Rio Hondo–Vincent No. 2 500-kV T/L (initially energized at 220 kV) and Section of New Mira Loma–Vincent 500-kV T/L

- Initiates at the existing Vincent Substation and ends at the southern boundary of the ANF
- Remove approximately 5 miles of the existing Rio Hondo–Vincent No. 2 220-kV T/L between Vincent Substation and the "crossover" span (S6 MP 5.0)
- Construct new approximately 5-mile single-circuit Mira Loma–Vincent 500-kV T/L from the Vincent Substation to the "crossover" span (S6 MP 5.0)
- Remove approximately 26.9 miles of the existing Antelope–Mesa 220 kV T/L from Vincent Substation to the southern boundary of the ANF
- Construct new approximately 26.9-mile single-circuit Rio Hondo–Vincent No. 2 500-kV T/L (initially energized at 220 kV)
- Eliminate the existing crossing of the Rio Hondo–Vincent No. 2 220-kV T/L over the Antelope–Mesa 220-kV T/L
- All proposed permanent infrastructure to be located within existing ROW (approx. 27 miles)
- Erect approximately 138 total new transmission structures (105 on NFS lands – 99 LSTs and 6 TSPs), including:
  - 2 single-circuit 220-kV LSTs (90-120 feet tall)
  - 26 single-circuit 500-kV TSPs (75-200 feet tall)
  - 106 single-circuit 500-kV LSTs (85-193 feet tall)
  - 4 three-pole dead-end 500-kV structures (75-80 feet tall) [1 on NFS lands]
- Construction of approximately 60 structures by helicopter (all on NFS lands), supported by 10 helicopter staging areas (9 on NFS lands)
- Will require approximately 16 wire setup sites for pulling/tensioner/splicing of conductor wire (136 on NFS lands)
- The majority of this segment will be located on NFS lands including: S6 MP 1.45-1.7, 2.75-5.3, 5.65-6.7, 6.7-6.95, 7.05-24.8 (in-holdings or other non-NFS lands are located between the mileposts listed)

Segment 7: Section of New Replacement Rio Hondo–Vincent No. 2 500-kV T/L (initially energized at 220 kV) and Section of New Mira Loma–Vincent 500-kV T/L

- Initiates at the southern boundary of the ANF and ends at the existing Mesa Substation
- Remove approximately 15.8 miles of the existing Antelope–Mesa 220-kV T/L between the southern boundary of the ANF and the Mesa Substation
- Construct new approximately 15.8-mile 500-kV double-circuit T/L to include the Rio Hondo–Vincent No. 2 500-kV T/L (initially energized at 220 kV) and the new Mira Loma–Vincent 500-kV T/L
- Connect the new Rio Hondo–Vincent No. 2 500-kV T/L (initially energized at 220 kV) into the Rio Hondo Substation
- Relocate several existing 66-kV subtransmission lines between the existing Rio Hondo Substation and the existing Mesa Substation. With incorporation of Alternative 7, this segment includes two short segments of 66-kV underground and a segment of re-routed overhead 66-kV lines, as follows:
  - (1) an approximately 6,000-foot underground segment of 66-kV subtransmission line from S7 MP 8.9 to 9.9 through the Duck Farm Project; and
  - (2) an approximately 3,300-foot re-route of 66-kV subtransmission line, which will be placed underground, beginning at approx. S7 MP 11.4 and proceed north along Peck Road, then west along Durfee Road, rejoining the 220-kV ROW (Project ROW) at approx. S7 MP 12.025.
  - (3) relocation of the existing Rio Hondo–Amador–Jose–Mesa 66-kV subtransmission line to the north side of the existing 220-kV ROW beginning at Durfee Avenue (~S7 MP 12.0) through Legg Lake Park and the Whittier Narrows Recreation Area to just east of San Gabriel Boulevard (~S7 MP 13.6).
- All proposed permanent 500-kV infrastructure to be located within existing ROW (approx. 15.8 miles); New and expanded ROW required for 66-kV re-routes.
- Erect approximately 85 new transmission structures, including:
  - 1 double-circuit 220-kV LST (185 feet tall)
  - 2 double-circuit 500-kV TSPs (195-200 feet tall)
  - 3 single-circuit 500-kV LSTs (113-175 feet tall)
  - 79 double-circuit 500-kV LSTs (147-262 feet tall)
- Erect approximately 128 new double-circuit 66-kV Light Weight Steel Poles (LWSPs) and TSPs
- Will require approximately 16 wire setup sites for pulling/tensioner/splicing of conductor wire

Segment 8: Section of New Mira Loma–Vincent 500-kV T/L

- Initiates near the existing Mesa Substation and ends at the existing Mira Loma Substation
- Remove various 220-kV T/L structures between the existing Mesa Substation and the existing Mira Loma Substation
- Construct approximately 33 miles of new double-circuit 500-kV T/L to include approximately 33 miles of the new Mira Loma–Vincent 500-kV T/L (Segments 8A/8C) (Note: The CPUC has issued a construction stay for Segment 8A within the City of

Table 2.2-1. Summary of Approved Project (Combination of Alternatives 2, 3, 6, and 7) Components

Chino Hills which will continue until the CPUC makes a final determination on undergrounding options; Segment 8A undergrounding options are not the subject of this SEIR/SEIS.)

- Construct approximately 7 miles of new double-circuit 220-kV T/L from the Chino Substation to the Mira Loma Substation (Segment 8B)
- Relocate several existing 66-kV subtransmission lines in the area of the Mesa and Chino Substations. With incorporation of Alternative 7, this segment includes re-routing a short segment of 66-kV overhead out of the Whittier Narrows Recreation Area. Option 1 begins near the San Gabriel Junction (S8A MP 2.2) and continues southeast along San Gabriel Boulevard and then Siphon Road to rejoin the 220-kV ROW (proposed Project ROW) at approx. S8A MP 3.8.
- Most of the proposed infrastructure will be located within existing ROW, except for the following:
  - San Gabriel River Crossing [Option 1] (66-kV) new ROW (existing: none; future: 0.2-mile or 1,600-foot, 60-foot-wide)
  - Rose Hills Memorial Park ROW relocation (existing: 1.1-mile, 150 -foot-wide; future: 1.4-mile, 240-foot-wide)
  - Hacienda Heights ROW expansion (existing: 2.15-mile, 150 to 230-foot-wide; future: 250 to 330-foot-wide)
  - Fullerton Road new ROW (existing: none; future: 0.4-mile, 100-foot-wide)
  - Ontario (near Mira Loma Substation) ROW expansion (existing: 0.45-mile, 175-foot-wide; future: 325-foot-wide)
- Erect approximately 226 new transmission structures, including:
  - 2 single-circuit 220-kV LSTs (65-75 feet tall)
  - 57 double-circuit 220-kV LSTs (113-180 feet tall)
  - 3 single-circuit 500-kV LSTs (128-149 feet tall)
  - 92 double-circuit 500-kV LSTs (147-255 feet tall)
  - 2 single-circuit 220-kV TSPs (85-95 feet tall)
  - 11 double-circuit 220-kV TSPs (75-115 feet tall)
  - 5 three-pole dead-end 220-kV structures (75-110 feet tall)
  - 4 single-circuit 500-kV TSPs (120-170 feet tall)
  - 50 double-circuit 500-kV TSPs (150-195 feet tall)
- Erect approximately 45 new double-circuit 66-kV subtransmission LWSPs
- Will require approximately 33 wire setup sites for pulling/tensioner/splicing of conductor wire

Segment 9: Substation Facilities

- Construct new Whirlwind Substation; activity will require acquisition of a new approximately 106-acre substation property
- Expand and upgrade existing Antelope and Vincent Substations to accommodate new 500-kV and 220-kV equipment; activity will require acquisition of additional substation property — approximately 20 acres for Antelope upgrade and approximately 0.2 acre for Vincent upgrade; Vincent expansion will disturb approximately 20 acres
- Upgrade existing Mesa and Gould Substations to accommodate new 220-kV equipment
- Upgrade existing Mira Loma Substation to accommodate new 500-kV equipment

1 - Since approval of the TRTP, the Cottonwind Substation has not been built; the two projects that were anticipated to connect to the Cottonwind Substation now connect directly to the Whirlwind Substation utilizing the two "Cottonwind-Whirlwind" positions. The two single-circuit 220-kV T/Ls approved as part of Segment 4 are no longer necessary and have not been built.

Segment 10: Whirlwind–Windhub 500-kV T/L (S10 MP 0.0 to 16.8)

Segment 10 includes a new approximately 16.8-mile-long single-circuit 500-kV T/L from the Windhub Substation (not part of Project) to the new Whirlwind Substation (see Final EIR and/or Final EIS Figures 2.2-1b through 2.2-1e). The new 500-kV T/L will be built in a new 330-foot-wide ROW to be acquired by SCE.

Segment 4: Cottonwind–Whirlwind 220-kV T/Ls (S4 MP 0.0 to 4.0) and Vincent–Whirlwind 500-kV T/L (S4 MP 4.0 to 20.0)

As previously noted, the northern portion of Segment 4 (S4 MP 0.0 to 4.0) which included approximately 4 miles of two new parallel 220-kV T/Ls between the proposed Cottonwind Substation (not part of Project) and the new Whirlwind Substation has not been built. The two projects expected to connect to the Cottonwind Substation now connect directly to the Whirlwind Substation utilizing the two "Cottonwind-Whirlwind" positions. These positions are now energized with the Manzana Wind Power Project and the Pacific Wind Project. The two single-circuit 220-kV T/Ls approved as part of Segment 4 are no longer necessary and have not been built.

The southern portion of Segment 4 will connect the Whirlwind Substation (S4 MP 4.0) to SCE's existing Vincent Substation (S4 MP 20.0) near Acton by installing a new, approximately 16.0-mile, 500-kV single-circuit T/L that will connect to the northern end of the previously approved Antelope–Vincent 500-kV T/L (Segment 2) completing the circuit to Vincent Substation (i.e., Vincent–Whirlwind 500-kV T/L) (see Final EIR and/or Final EIS Figures 2.2-1e through 2.2-1g). Within this southern portion of Segment 4, Alternative 3 (West Lancaster Alternative) will be implemented, which re-routes the new 500-kV T/L along 115th Street West rather than 110th Street West, as shown in Final EIR and/or Final EIS Figure 2.3-1. The Approved Project will deviate from SCE's Proposed Project (Alternative 2) beginning at approximately S4 MP 14.9, where the new 500-kV T/L will instead turn south down 115th Street West for approximately 2.9 miles and turn east for approximately 0.5 mile, rejoining SCE's proposed route at S4 MP 17.9 (now S4 MP 18.3). This 3.4-mile re-route increase the overall distance of Segment 4 by approximately 0.4 mile (15.6 miles vs. 16.0 miles); however, the number of overall structures decreases by one due to greater spacing between structures compared to SCE's Proposed Project.

To match the overall system requirements, the existing Midway–Vincent No. 3 500-kV T/L, which the new Vincent–Whirlwind 500-kV T/L will parallel, will be cut and routed (or terminated) into the Whirlwind Substation (north end) and the Antelope Substation (south end). To minimize the number of physical 500-kV crossings, the Midway–Vincent No. 3 500-kV T/L will be cutover to the previously approved Antelope–Tehachapi 500-kV T/L (Segment 3A).

Segment 5: Antelope–Vincent No. 2 500-kV T/L (S5 MP 0.0 to 17.4)

Segment 5 consists of approximately 17.4 miles of new single-circuit 500-kV T/L between SCE's existing Antelope and Vincent Substations, located in Lancaster and near Acton, respectively (see Final EIR and/or Final EIS Figures 2.2-1g through 2.2-1j). This new 500-kV T/L will be built next to a similar existing 500-kV T/L and will replace two 220-kV T/Ls that will be removed as part of the Approved Project. Construction will mostly occur within existing ROW.

Segment 11: Mesa–Vincent No. 2 (via Gould) 500/220-kV T/L

Segment 11 will replace approximately 19 miles of existing single-circuit 220-kV T/L from Vincent Substation, located near Acton, to Gould Substation in La Cañada Flintridge with a new approximately 18.7-mile single-circuit 500-kV T/L (Mesa–Vincent No. 2 500-kV T/L from S11 MP 0.0 to 18.7), initially energized to 220 kV (see Final EIR and/or Final EIS Figures 2.2-1j through 2.2-1n). The Approved Project alignment along this portion of Segment 11 is identical to SCE's Proposed Project (Alternative 2); however, the amount of ground-based construction and helicopter construction was altered as a result of implementing a combination of Alternative 2 (SCE Proposed Project) and Alternative 6 (Maximum Helicopter Construction in the ANF). The number of towers removed/constructed by helicopter increased from SCE's original proposal of 16 towers to approximately 36 towers. To accommodate the helicopter construction activities, the following helicopter staging/ support areas (a.k.a. helicopter assembly yard [HAY]) were approved as part of the Project for utilization during construction on NFS lands (Forest Service 2010 ROD — see also Final EIS Figures 2.2-83 and 2.6-1):

Final EIS Label (Alternative)	Site Name/Location
#4 (Alt 6)	Mount Gleason
HAY 10X (Alt 2)	Camp 16
HAY 12 (Alt 2)	Mt Gleason Road Turnout
HAY 4 (Alt 2)	Wickiup
#10 (Alt 6)	Forest Highway Turnout
SCE #3B (Alt 2)	Maple Canyon

Off NFS lands, four additional helicopter staging/support areas were approved (see Final EIS Figures 2.2-83 and 2.6-1):

(1) SCE#0 (Alt 2): Adjacent to Beartrap Canyon, south of Aliso Canyon Road, and approximately 0.45 mile east of S11 MP 3.9 (Within the ANF on a private in-holding)

(2) SCE#4 (Alt 2): Adjacent to and west of Mt Lukens Road (Forest Road 2N76.3), Angeles Crest Station, and S11 MP 18.0 (South of the ANF – off NFS lands)

(3) SCE#5 (Alt 2): Along Forest Road 2N69 just north of Gould Substation and west of S11 MP 18.6 (South of the ANF – off NFS lands)

(4) Site #2 (Alt 6): South of Aliso Canyon Road and east of an existing SCE access road, east of S11 MP 3.75 (Within the ANF on a private in-holding)

As part of the implementation of the Approved Project, foundations for towers within the ANF which are to be constructed by helicopter will be installed using micropile methods, as described in Final EIR and/or Final EIS Section 2.2.12.5 (Tower and Pole Construction). A portable drill rig will be utilized for installation of micropile foundations rather than a tracked excavator, which lacks the necessary precision. For those structures not installed by helicopter, the construction method will be identical to that proposed for SCE Proposed Project (Alternative 2), as described in Final EIR and/or Final EIS Section 2.2.12.5.

As part of Segment 11, a second approximately 17.5-mile 220-kV T/L circuit will be installed on the currently empty side of the existing double-circuit towers, which currently hold only the Eagle Rock-Mesa 220-kV T/L, between the Gould Substation property in La Cañada Flintridge (S11 MP 18.7) and the Mesa Substation (S11 MP 36.2) in Monterey Park (see Final EIR and/or Final EIS Figures 2.2-1n through 2.2-1p and 2.2-1v). Segment 11 will generally be within existing ROW (see Final EIR and/or Final EIS Figures 2.2-1k through 2.2-1n).

Segment 6: Section of New Replacement Rio Hondo–Vincent No. 2 500-kV T/L and Section of New Mira Loma–Vincent 500-kV T/L

Segment 6 will consist of approximately 32 miles of single-circuit 500-kV T/L in existing ROW from the Vincent Substation located near Acton to the southern boundary of the ANF (see Final EIR and/or Final EIS Figures 2.2-1j through 2.2-1k and 2.2-1q through 2.2-1t). Approximately 27 miles of the existing Antelope–Mesa 220-kV T/L structures will be rebuilt with 500-kV single-circuit T/L structures from the Vincent Substation to the southern boundary of the ANF and be initially energized at 220 kV. In addition, approximately 5 miles of the existing Rio Hondo–Vincent No. 2 220-kV T/L structures will be rebuilt with 500-kV single-circuit T/L structures from the Vincent Substation to the existing "crossover" span (S6 MP 4.8). The existing crossing or "crossover" of the Rio Hondo–Vincent No. 2 220-kV T/L over the Antelope–Mesa 220-kV T/L will be eliminated. The completion of Segment 6 will result in two roughly parallel circuits constructed to 500-kV standards in the existing ROW from the Vincent Substation (S6 MP 0.0) to the southern boundary of the ANF (S6 MP 26.9). The easterly circuit will be the new Rio Hondo–Vincent No. 2 500-kV T/L initially energized at 220 kV (requires 26.9 miles of new 500-kV T/L). The westerly circuit will become a section of the new Mira Loma–Vincent 500-kV T/L (requires only approximately 5 miles of new 500-kV T/L, as the existing structures south of the "crossover span" to the southern boundary of the ANF are currently constructed to 500-kV standards with 500-kV structures). The majority of this segment (approximately 21.85 miles) will be located on NFS lands within the ANF including: S6 MP 1.45-1.7, 2.75-5.3, 5.65-6.7, 6.7-6.95, 7.05-24.8 (in-holdings or other non-Forest properties are located between the mileposts listed).

The Approved Project alignment for Segment 6 is identical to SCE's Proposed Project (Alternative 2); however, the amount of ground-based construction and helicopter construction will be altered as a result of implementing a combination of Alternative 2 (SCE's Proposed Project) and Alternative 6 (Maximum Helicopter Construction in the ANF). The number of towers removed/constructed by helicopter increases from SCE's original proposal of 17 towers to approximately 60 towers.

To accommodate the helicopter construction activities along the portion of Segment 6 in the ANF, the following helicopter staging/support areas were approved as part of the Project for utilization during construction on NFS lands (Forest Service 2010 ROD — see also Final EIS Figures 2.2-83 and 2.6-1):

Final EIS Label	Site Name/Location
HAY 1	Aliso Canyon
#13	Millcreek Helispot
#5	Rabbit Peak
HAY5A	Chilao
HAY 6	Shortcut Station
#7	Barley Flats
SCE #7	Newcomb's Pass
HAY 8	Cogswell Dam
SCE #8	Van Tassel Ridge

Off NFS lands, one additional helicopter staging/support area would be utilized (see Final EIS Figures 2.2-83 and 2.6-1): SCE#9: Fish Canyon Rifle Range, 1.2 miles east of S7 MP 0.6 accessed via Fish Canyon Road in Azusa.

As part of the implementation of the Approved Project, foundations for towers within the ANF which are constructed by helicopter will be installed using micropile methods. A portable drill rig will be utilized for installation of micropile foundations rather than a tracked excavator, which lacks the necessary precision. For those structures not installed by helicopter, the construction method will be identical to that proposed for SCE Proposed Project (Alternative 2), as described in Final EIR and/or Final EIS Section 2.2.12.5.

Segment 7: Section of New Replacement Rio Hondo–Vincent No. 2 500-kV T/L and Section of New Mira Loma–Vincent 500-kV T/L

Segment 7 is a continuation of Segment 6 (see discussion above), where the existing Rio Hondo–Vincent No. 2 220-kV T/L on existing 500-kV structures (in the Rio Hondo–Vincent alignment) will be renamed the new Mira Loma–Vincent 500-kV T/L, and the existing Antelope–Mesa 220-kV T/L structures (in the Antelope–Mesa alignment) will be replaced by the new Rio Hondo–Vincent No. 2 500-kV T/L (initially energized to 220 kV) structures.

Segment 7 will consist of approximately 15.8 miles of single- and double-circuit 500-kV structures in the existing ROW from the southern boundary of the ANF, near the City of Duarte, south to SCE's existing Rio Hondo Substation in the City of Irwindale, and then continuing southwest across the San Gabriel Valley to SCE's existing Mesa Substation in Monterey Park (see Final EIR and/or Final EIS Figures 2.2-1t through 2.2-1v). Federal lands (USACE) crossed by Segment 7 include approximately 1.7 miles in the Santa Fe Dam area (see Final EIR and/or Final EIS Figure 2.2-1u) and approximately 2.5 miles in the Whittier Narrows Recreation Area (see Final EIR and/or Final EIS Figure 2.2-1v).

Segment 7 will result in two parallel T/L circuits between the southern boundary of the ANF and the existing Rio Hondo Substation, primarily on double-circuit structures, which replace the existing Antelope–Mesa 220-kV T/L structures (in the Antelope–Mesa alignment), where the east circuit will be the final section of the new Rio Hondo–Vincent No. 2 500-kV T/L and the west circuit will be a section of the new Mira Loma–Vincent 500-kV T/L. The new Rio Hondo–Vincent No. 2 500-kV T/L (initially energized to 220-kV) will connect into the existing Rio Hondo Substation; however, the new Mira Loma–Vincent 500-kV T/L will not and instead will continue on towards the Mesa Substation.

From the Rio Hondo Substation (S7 MP 5.1) to the San Gabriel Junction (S7 MP 13.7), the existing Antelope–Mesa 220-kV structures will be replaced with double-circuit structures, where the new Mira Loma–Vincent 500-kV T/L will be located on these new double-circuit structures. The double-circuit structures will be strung with 500-kV conductor in a split-phase configuration. At this point (San Gabriel Junction), the new Mira Loma–Vincent 500-kV T/L will leave the Antelope–Mesa 220-kV T/L alignment and crossover to the existing Chino–Mesa 220-kV T/L alignment. This crossover point is the beginning of the Segment 8 (Subsegment 8A) section of the new Mira Loma–Vincent 500-kV T/L (refer to Segment 8 description below). For the final portion of Segment 7, from the San Gabriel Junction (S7 MP 13.7) to just east of the Mesa Substation (S7 MP 15.8), the existing Antelope–Mesa 220-kV single-circuit LSTs will be removed and replaced with new double-circuit 500-kV LSTs, located approximately adjacent to the existing structures.

To accommodate the 500-kV construction along Segment 7, various lower-voltage subtransmission lines between the Rio Hondo Substation and Mesa Substation will be relocated mostly within the existing ROW. For the Approved Project, these subtransmission relocations are a combination of Alternative 2 (SCE's Proposed Project) and Alternative 7 (66-kV Subtransmission). The relocation of the Rio Hondo-Bradbury 66-kV line, Rio Hondo-Amador, Rio Hondo-Anita No. 2, Rio Hondo-Amador-Jose-Mesa, Mesa-Rush No. 2, Mesa-Anita-Eaton, Mesa-Narrows, and Mesa-Ravendale-Rush 66-kV lines will be identical to SCE's Proposed Project (Alternative 2), as described in Final EIR and/or Final EIS Section 2.2.8.1, with the following exceptions resulting from the implementation of Alternative 7.

Duck Farm 66-kV Underground

This element of the Approved Project will consist of undergrounding the Rio Hondo-Amador-Jose-Mesa 66-kV subtransmission line along Segment 7 through the River Commons or Duck Farm Project (see Final EIR and/or Final EIS Figure 2.7-1). Beginning at the north side of Valley Boulevard located at approximately S7 MP 8.9, the 66-kV subtransmission line will be placed underground along the west edge of the ROW for a distance of approximately 6,000 feet to just south of S7 MP 9.9, at which point the 66-kV subtransmission line will transition aboveground and continue overhead to Peck Road, as proposed under Alternative 2 (SCE's Proposed Project).

Whittier Narrows 66-kV Underground Re-Route

This element of the Project consists of re-routing and undergrounding the Jose-Mesa 66-kV subtransmission line around the Whittier Narrows Recreation area in Segment 7 (see Final EIR and/or Final EIS Figure 2.7-2). Beginning at Peck Road (S7 MP 11.4) the 66-kV subtransmission line, which under SCE's Proposed Project (Alternative 2) will be re-located to the western edge of the ROW, will leave the existing ROW at Peck Road and be placed underground. The new underground 66-kV subtransmission line will proceed approximately 300 feet north along Peck Road, then turn west and continue on Durfee Road for approximately 3,000 feet before rejoining SCE's proposed alignment (Alternative 2) at S7 MP 12.025.

Whittier Narrows 66-kV Overhead Re-Route

This element of the Project consists of relocating the existing Rio Hondo–Amador–Jose–Mesa 66-kV subtransmission line to the north side of the existing 220-kV ROW beginning at Durfee Avenue (~S7 MP 12.0) through Legg Lake Park and the Whittier Narrows Recreation Area to just east of San Gabriel Boulevard (~S7 MP 13.6). A 50-foot expansion of the existing ROW is require between approximately S7 MP 12.7 (Legg Lake) and S7 MP 13.6 (just east of San Gabriel Boulevard). The expanded ROW will provide the additional clearance for conductor sway required by the new double-circuit 500-kV structures thereby allowing taller 66-kV LWSPs to be installed in a one-for-one configuration with the new 500-kV structures. As such, fewer, but taller, 66-kV structures will be required along this portion of the Segment 7 alignment compared to SCE's Proposed Project (Alternative 2).

Segment 8: Section of New Mira Loma–Vincent 500-kV T/L

Segment 8 is divided into three subsegments (8A, 8B and 8C) and consists of approximately 33 miles of single-circuit and double-circuit 500-kV T/L beginning at the San Gabriel Junction (S8A MP 2.2) and ending at the Mira Loma Substation in Ontario (see Final EIR and/or Final EIS Figures 2.2-1v through 2.2-1y). Existing ROW will be used for the majority of Segment 8. Also as part of Segment 8, various subtransmission and distribution lines near Mesa Substation and Chino Substation will be relocated.

As a general overview, Subsegments 8A, 8B, and 8C will consist of the following:

Subsegment 8A

Rebuild the existing Chino–Mesa 220-kV T/L (not currently energized) on 500-kV double-circuit structures beginning approximately 0.5 mile west of the Chino Substation (S8A MP 28.0) to a point just east of the Mesa Substation (See subtransmission line discussion below for the portion of the route between Chino Substation and 0.5 mile west of Chino Substation). From the Chino Substation at S8A MP 28.4 to a point approximately 0.75 mile west of the Mira Loma Substation at S8A MP 34.0, the existing Chino–Mira Loma No. 2 220-kV T/L and Chino–Mira Loma No. 3 220-kV T/L structures will be removed and replaced with 500-kV double-circuit structures. The new double-circuit will be energized as the Mira Loma–Vincent 500-kV T/L in a split-phased configuration. From this point (S8A MP 34.0), 500-kV single-circuit structures will be built parallel to the existing Chino–Mira Loma No. 1 220-kV T/L structures and the existing Lugo–Serrano 500-kV T/L structures into the Mira Loma Substation at S8A MP 35.2. (Note: The CPUC has issued a construction stay for Segment 8A within the City of Chino Hills [Decision 11-11-020, as modified by Decision 12-03-050], which per the July 12, 2012 ruling of the Assigned Commissioner will continue until the CPUC makes a final determination on undergrounding options; Segment 8A undergrounding options are not the subject of this SEIR/SEIS.)

The following subtransmission lines will be rearranged to accommodate the proposed 500-kV circuit:

- Existing 66-kV LSTs will be removed and replaced with LWSPs beginning at the San Gabriel Junction (S8A MP 2.2) and continuing for approximately 2.1 miles (S8A MP 4.3) along the south side of the existing ROW; however, between the San Gabriel Junction (S8A MP 2.2) and the east side of the San Gabriel River (S8A MP 3.8) the 66-kV lines will instead be re-routed with implementation of Alternative 7, as described below under "Whittier Narrows 66-kV Overhead Re-Route, Option 1."
- Beginning 0.5 miles west of Chino Substation (S8A MP 28.0), three spans of the existing Chino–Soquel 66-kV T/L (currently placed on 220-kV structures) will be rebuilt on 500-kV double-circuit structures to the Chino Substation.
- Multiple 66-kV lines in the vicinity of the Chino Substation beginning approximately 500 feet west of Central Avenue (S8A MP 27.7) to Magnolia Avenue (S8A MP 28.7) will be placed underground to make room for the new 500-kV double-circuit structures.

As noted above, with the inclusion of Alternative 7, the following additional 66-kV re-route will be implemented as part of the Approved Project.

- **Whittier Narrows 66-kV Overhead Re-Route, Option 1.** This element of the Project consists of relocating two 66-kV circuits (Mesa-Narrows 66-kV and Walnut-Hillgen-Industry-Mesa-Reno 66-kV), approximately 1.63 miles of overhead 66-kV lines (x2 lines), and vacating the southern end of the existing Project ROW from San Gabriel Boulevard (just west of the San Gabriel Junction, S8A MP 2.2) to the east side of the San Gabriel River (S8A MP 3.8). The existing 66-kV subtransmission lines currently split at the San Gabriel Junction (S8A MP 2.2) with one line proceeding along the existing 220-kV ROW and the other line proceeding southwest along San Gabriel Boulevard. As such, between the San Gabriel Junction and Lincoln Avenue existing infrastructure will be utilized. As shown in Final EIR and/or Final EIS Figure 2.7-2, these 66-kV circuits will be relocated beginning at the intersection of San Gabriel Boulevard and Lincoln Avenue and proceed southeast approximately 1,880 feet along San Gabriel Boulevard until Rosemead Boulevard, at which point the street name changes to Durfee Avenue. At this point, the 66-kV lines will continue for approximately 700 feet southeast across Durfee Avenue utilizing new LWSPs and then continue approximately 2,100 feet southeast along Siphon Road to the San Gabriel River replacing the existing idle 66-kV structures with new TSPs. New ROW, approximately 1,600-feet long and 60-feet wide, will be required to cross from the existing 66-kV ROW on the west side of the San Gabriel River to the existing 220-kV ROW located on the east side of the San Gabriel River (near Structure 9), thereby allowing the new 66-kV lines to tie back into the 66-kV lines within the Project ROW (S8A MP 3.8) completing the circuit. In Segment 8A, the two 66-kV lines will transition within the existing ROW to underground for approximately 200 feet across the width of the ROW from the south side and then rise up on the north side of the ROW to join the existing lines.

Subsegment 8B

Rebuild the Chino–Mira Loma No. 1 220-kV T/L from the Chino Substation (S8B MP 0.0) to the Mira Loma Substation (S8B MP 6.8) with 220-kV double-circuit structures to accommodate the Chino–Mira Loma No. 1 220-kV and Chino–Mira Loma No. 2 220-kV T/Ls.

Subsegment 8C

The new Chino–Mira Loma No. 3 220-kV T/L will occupy the south circuit on the new double-circuit 500-kV LSTs (installed as described in Subsegment 8A) from the Chino Substation (S8C MP 0.0) to approximately 0.8 miles west of the Mira Loma Substation (S8C MP 6.4). The northern circuit will be the new Mira Loma–Vincent 500-kV T/L as described above for Subsegment 8A. The new Chino–Mira Loma No. 3 220-kV T/L will utilize existing 220-kV double-circuit structures to connect into Mira Loma Substation.

Segment 8 (Overall)

The completed Segment 8 from Chino Substation to just east of the Mesa Substation will result in 500-kV double-circuit structures, primarily on existing ROW, with conductors operated in a split-phased configuration to accommodate the new Mira Loma–Vincent 500-kV T/L. From the Chino Substation to the Mira Loma Substation, there will be approximately 5 miles of 500-kV double-circuit structures, and approximately 1.2 miles of 500-kV single-circuit structures, primarily on existing ROW. On the double-circuit section, the north circuit will be the new Mira Loma–Vincent 500-kV T/L (8A) and the south circuit will be the new Chino–Mira Loma No. 3 220-kV T/L (8C). The single-circuit section will accommodate the new Mira Loma–Vincent 500-kV T/L. In addition, between the Chino Substation and the Mira Loma Substation there will be approximately 7 miles of 220-kV double-circuit structures, primarily on existing ROW, accommodating the new Chino–Mira Loma No. 1 220-kV and Chino–Mira Loma No. 2 220-kV T/Ls (8C).

To reduce conductor swing that may occur between the existing 220-kV T/Ls and The new Mira Loma–Vincent 500-kV T/L, additional 220-kV structures will be added. These additional structures will reduce the span length between structures, which will reduce the conductor slack and thereby limit the range of motion for a given span. The new 220-kV structures will be added in various areas throughout Segment 8, including near

S8A MP 2.2 (San Gabriel Junction), 4.2 (San Gabriel River Freeway crossing), 8.2 (near existing structure No. 30), 13.5 (Fullerton Road/Pathfinder Road), and 19.2 (turn tower).

Segment 9: Substation Facilities

Segment 9 includes additions and upgrades of substation facilities. The Approved Project includes the following: the new 500/220-kV Whirlwind Substation (the only new facility that will be constructed); upgrades to the existing Antelope, Vincent, Mesa, Gould, and Mira Loma Substations in order to accommodate new 500/220-kV equipment; and acquisition of approximately 20.2 acres (combined total) of additional substation property at the Antelope and Vincent Substations.

Whirlwind Substation

Whirlwind Substation will be a new 500/220-kV substation located near the intersection of 170th Street and Holiday Avenue in Kern County (see Final EIR and/or Final EIS Figure 2.2-75). The site chosen for the new substation encompasses approximately 106 acres, which will be acquired by SCE. Facilities associated with the proposed new substation, such as the substation pad, access road, and retention pond represent a permanent land disturbance of approximately 70 acres (see Final EIR and/or Final EIS Table 2.2-10 at the end of Chapter 2). In addition to the initial 70 acres, an area of approximately 27 acres (for a total of approximately 97 acres) will be graded within the fence line of the new substation to allow adequate room in the future for additional equipment that may be necessary to facilitate transmission of additional energy generation. No additional facilities or equipment will be installed as part of the Approved Project within this future expansion area.

Antelope Substation

The Antelope Substation will be upgraded in order to accommodate new 500-kV transmission equipment (see Final EIR and/or Final EIS Figure 2.2-1g). The proposed expansion of the substation was licensed and addressed in the Proponent's Environmental Assessment (PEA) submission to support the Antelope Transmission Project, Segment 1. The exceptions to the licensing were the installation of a 200 MVAR Static VAR Compensator (SVC) and two 500-kV, 150 MVAR each, shunt capacitor banks. The installation of the new equipment will be in an area of approximately 18 acres. Approximately 20 acres of additional land will be acquired by SCE; the additional land at the substation site will accommodate the additional new construction at the Antelope Substation (see Final EIR and/or Final EIS Figure 2.2-76).

Relocation of the Sagebrush Subtransmission Line. As part of the expansion of the Antelope Substation, the existing Sagebrush subtransmission line will be re-routed around the 500-kV expansion area (The Sagebrush line currently bisects this area). Beginning just south of West Avenue J, the Sagebrush line will be re-routed southeast for approximately 1,500 feet, paralleling the east side of the 500-kV expansion area, before turning southwest for approximately 1,500 feet, paralleling the south side of the 500-kV expansion area, to rejoin the existing alignment.

Vincent Substation

In order to accommodate the proposed transmission connections, the existing 500/220-kV Vincent Substation will be upgraded to include two separate extensions of existing switchyards (see Final EIR and/or Final EIS Figure 2.2-1j and 2.2-77). At the southwestern corner of the facility, the south 220-kV bus extension requires an addition to the existing limits of the graded pad. To match the existing site grade, a retaining wall will be constructed and back-filled. The 500-kV switchyard will be extended to the west by approximately 1,100 feet, where extensive new grading will be required. The 500-kV substation expansion will be on the existing SCEfee owned property. The 220-kV switchyard expansion will require approximately 0.2 acre of new property acquisition, and will disturb approximately 20 acres of existing and new substation land.

Gould Substation

The Gould Substation improvements include upgrading the existing 220-kV switchyard to accommodate the connection of the new Eagle Rock–Gould 220-kV T/L, as well as the 220-kV connections of the existing transformer banks to double breaker positions. All upgrades at the Gould Substation will take place within the existing fence line (see Final EIR and/or Final EIS Figure 2.2-1n).

Mesa Substation

The Mesa Substation improvements include upgrading the existing 220-kV switchyard with additional equipment to accommodate the connection of the new Mesa–Vincent No. 1 220-kV T/L in Segment 11. All upgrades at the Mesa Substation will take place within the existing fence line (see Final EIR and/or Final EIS Figure 2.2-1v).

Mira Loma Substation

The Mira Loma Substation improvements include constructing a new 500-kV position to terminate the new Mira Loma–Vincent 500-kv T/L, as described under Segment 8. All work will take place within the existing Mira Loma fence line (see Final EIR and/or Final EIS Figure 2.2-1y).

2.3 Proposed Modifications – Modified Project

This section describes the proposed modifications to the Approved Project (i.e., Modified Project), as initially detailed in SCE's Petition for Modification of Decision 09-12-044, and revised based on additional recommendations from the FAA and input from SCE through supplementary data requests. All approved mitigation measures from the Final EIR and ROD would be implemented as part of the Modified Project, as well as any additional mitigation measures presented as part of the issue area analysis provided in Sections 4.1 through 4.6 of this SEIR/SEIS.

2.3.1 Installation of Marker Balls on Transmission Line Spans

SCE proposes to install approximately 2,248 marker balls on the 276 T/L spans recommended by the FAA. Figures 2.1-1a through 2.1-1j, provided at the end of this section, identify the T/L spans where marker balls would be installed. (Note: To avoid potential safety issues, a few T/L spans have already had marker balls installed, as the conductor was installed prior to receiving the FAA recommendations. These are denoted as "FAA Conditions Met with Spherical Markers Installed".) Table 2.3-1 lists the T/L spans for which SCE proposes to install marker balls per the FAA's recommendations, broken down by each segment of the TRTP, and the approximate number of marker balls on each span, based on the FAA's guidelines. (Note: The CPUC has issued a construction stay for Segment 8A within the City of Chino Hills, which will continue until the CPUC makes a final determination on undergrounding options; Segment 8A undergrounding options are not the subject of this SEIR/SEIS.)

Per FAA Advisory Circular AC 70/7460-1K, Obstruction Marking and Lighting (FAA, 2007 - Section 34), if a span requires three or fewer marker balls, then the marker balls on the span would all be aviation orange. If a span requires four or more marker balls, then the marker balls would alternate between aviation orange, white, and yellow. Normally, an orange sphere is placed at each end of a line and the spacing is adjusted (not to exceed 200 feet) to accommodate the rest of the markers. Marker balls would be spaced equally along the wire at intervals of approximately 200 feet or a fraction thereof. Intervals between markers should be less in critical areas near runway ends (i.e., 30 to 50 feet). They should be displayed on the highest wire or by another means at the same height as the highest wire. Where there is more than one wire at the highest point, the markers may be installed alternately along each wire if the distance between adjacent markers meets the spacing standard. This method allows the weight and wind loading factors to be distributed. Marker balls are typically 36 inches in diameter and weigh 20 to 30 pounds. Standard marker balls are made of plastic, aluminum, or fiberglass. SCE would select the type of marker ball most suitable for a particular span.

SCE proposes to install the marker balls on the overhead ground wire, per FAA guidelines. The ground wire to be installed for TRTP is believed to be adequate to support the weight of the marker balls; however, SCE anticipates that the installation of marker balls on 18 catenaries (wire spans) on the new Vincent-Mesa No. 2 line between Gould and Goodrich Substations (Segment 11B) would require the replacement of the existing skywrap fiber-optic cable with new optical ground wire to support the marker balls (SCE, 2012b, Q12-8). This is the only section of the TRTP where this issue is anticipated, although there are other portions where replacement of existing skywrap fiber optic cable may be required (SCE, 2012b, Q12-8). For certain spans, including adjacent T/L spans, SCE may need to replace the overhead ground wire to facilitate marker ball installation (see Section 2.3.4, Potential Replacement of Ground Wire).

A vast majority of the marker balls would be installed by helicopter because of this method's efficiency and minimal ground disturbance (see Section 2.3.1.1, Installation by Helicopter). In limited circumstances, installation of marker balls would occur by spacer cart (wheeled carrier), although this method is generally less efficient (see Section 2.3.1.2, Installation by Spacer Cart). Of these two construction methods, SCE would select the most suitable method for a particular span. (Note: Installation of marker balls by crane, as presented in SCE's Petition for Modification of Decision 09-12-044, is no longer being considered by SCE.)

As part of final engineering, SCE would confirm that the Project's design maintains all safety factors as required by CPUC General Order 95; all approved mitigation measures would be implemented, as applicable. Where necessary to maintain CPUC General Order 95's safety factors, SCE would implement minor modifications to the transmission structure designs. Minor modifications to LSTs could include, but are not limited to, increasing steel member thickness, adding reinforcing members, or switching light duty towers for heavy duty towers (SCE, 2012a, Q11-2). Modifications to TSPs could include, but are not limited to, the addition of steel reinforcements or the replacement of cross-arms (SCE, 2012a, Q11-2). Such modifications would not appreciably alter the T/L span design or increase the amount of ground disturbance already examined in the Final EIR and Final EIS. To date, however, SCE has not identified any structures that would require such modifications to implement the FAA's recommendations (SCE, 2012a, Q11-2).

Table 2.3-1. Transmission Line Span Marking Recommendations by the FAA

Segment-Phase	Structure Name	Adjacent Transmission Structures (Transmission Line Spans Only)		Span Length (feet)	Approximate Number of Marker Balls
5	CAT 5-1	18	19	1,937	11
5	CAT 5-2	19	20	1,268	7
5	CAT 5-3	20	21	1,421	7
5	CAT 5-4	24	25	1,931	11
5	CAT 5-5	27	28	893	5
5	CAT 5-6	29	30	2,208	13
5	CAT 5-7	32	33	1,326	7
5	CAT 5-8	42	43	1,402	7
5	CAT 5-9	43	M99-T1	844	5
5	CAT 5-10	44	45	860	5

Table 2.3-1. Transmission Line Span Marking Recommendations by the FAA

Segment-Phase	Structure Name	Adjacent Transmission Structures (Transmission Line Spans Only)		Span Length (feet)	Approximate Number of Marker Balls
5	CAT 5-11	45	46	1,639	9
5	CAT 5-12	47	48	1,855	11
5	CAT 5-13	48	49	1,332	7
5	CAT 5-14	49	50	1,289	7
5	CAT 5-15	50	51	943	5
5	CAT 5-16	51a	52	1,717	9
5	CAT 5-17	52	53	1,210	7
5	CAT 5-18	53	54	1,513	9
5	CAT 5-19	67	68	1,339	7
5	CAT 5-20	68	M105-T2	914	5
5	CAT 5-21	86	86A	1,145	7
5	CAT 5-22	86A	88	992	5
5	CAT 5-23	55	55A	666	3
5	CAT 5-24	55A	56	695	3
5	CAT 5-25	88	88A	1,151	7
5	CAT 5-26	88A	89	1,379	7
6	CAT 6-1	ML-V Const. #1	Vincent Sub	463	3
6	CAT 6-2	ML-V Const. #1	ML-V Const. #2	1,178	7
6	CAT 6-3	RH-V2 Const. #2	RH-V2 M27-T1	284	1
6	CAT 6-4	RH-V2 Const. #2	RH-V2 Const. #3	569	3
6	CAT 6-4a	ML-V Const. #2	ML-V Const. #3	463	3
6	CAT 6-5	RH-V2 Const. #4	RH-V2 Const. #5	1,151	7
6	CAT 6-6	ML-V Const. #4	ML-V Const. #5	1,113	7
6	CAT 6-7	RH-V2 Const. #5	RH-V2 Const. #6	1,573	9
6	CAT 6-8	ML-V Const. #5	ML-V Const. #6	1,611	9
6	CAT 6-9	RH-V2 Const. #9	RH-V2 Const. #10	1,523	9
6	CAT 6-10	ML-V Const. #9	ML-V Const. #10	1,628	9
6	CAT 6-11	RH-V2 Const. #16	RH-V2 Const. #17	899	5
6	CAT 6-12	RH-V1 M31-P1	RH-V1 M31-T2	947	5
6	CAT 6-13	RH-V2 Const. #19	RH-V2 Const. #20	988	5
6	CAT 6-14	ML-V Const. #19	ML-V Const. #20	1,140	7
6	CAT 6-15	RH-V1 M31-T2	RH-V1 M31-T3	2,258	13
6	CAT 6-16	RH-V2 Const. #20	RH-V2 Const. #21	2,258	13
6	CAT 6-17	ML-V Const. #20	ML-V Const. #21	2,165	13
6	CAT 6-18	RH-V2 Const. #22	RH-V2 Const. #23	1,984	11
6	CAT 6-19	RH-V2 Const. #23	RH-V2 Const. #24	1,816	11
6	CAT 6-20	RH-V2 Const. #24	RH-V2 Const. #25	1,156	7
6	CAT 6-21	RH-V2 Const. #25	RH-V2 Const. #26	738	5
6	CAT 6-22	RH-V2 Const. #29	RH-V2 Const. #30	1,676	9
6	CAT 6-23	RH-V2 Const. #33	RH-V2 Const. #34	1,957	11
6	CAT 6-24	RH-V2 Const. #37	RH-V2 Const. #38	2,311	13
6	CAT 6-25	RH-V2 Const. #38	RH-V2 Const. #39	671	3
6	CAT 6-26	RH-V2 Const. #39	RH-V2 Const. #40	1,837	11
6	CAT 6-27	RH-V2 Const. #41	RH-V2 Const. #42	1,857	11
6	CAT 6-28	RH-V2 Const. #46	RH-V2 Const. #47	1,198	7
6	CAT 6-29	RH-V2 Const. #47	RH-V2 Const. #48	1,450	9
6	CAT 6-30	RH-V2 Const. #48	RH-V2 Const. #49	3,316	19
6	CAT 6-31	RH-V2 Const. #49	RH-V2 Const. #50	826	5
6	CAT 6-32	RH-V2 Const. #50	RH-V2 Const. #51	786	5
6	CAT 6-33	RH-V2 Const. #51	RH-V2 Const. #52	1,289	7
6	CAT 6-34	RH-V2 Const. #52	RH-V2 Const. #53	2,385	13

Table 2.3-1. Transmission Line Span Marking Recommendations by the FAA

Segment-Phase	Structure Name	Adjacent Transmission Structures (Transmission Line Spans Only)		Span Length (feet)	Approximate Number of Marker Balls
6	CAT 6-35	RH-V2 Const. #53	RH-V2 Const. #54	2,383	13
6	CAT 6-36	RH-V2 Const. #56	RH-V2 Const. #57	1,198	7
6	CAT 6-37	RH-V2 Const. #57	RH-V2 Const. #58	1,443	9
6	CAT 6-38	RH-V2 Const. #58	RH-V2 Const. #59	1,774	9
6	CAT 6-39	RH-V2 Const. #62	RH-V2 Const. #63	970	5
6	CAT 6-40	RH-V2 Const. #63	RH-V2 Const. #64	1,091	7
6	CAT 6-41	RH-V2 Const. #64	RH-V2 Const. #65	926	5
6	CAT 6-42	RH-V2 Const. #65	RH-V2 Const. #66	1,928	11
6	CAT 6-43	RH-V2 Const. #66	RH-V2 Const. #67	489	3
6	CAT 6-44	RH-V2 Const. #69	RH-V2 Const. #70	1,128	7
6	CAT 6-45	RH-V2 Const. #70	RH-V2 Const. #71	2,872	15
6	CAT 6-46	RH-V2 Const. #71	RH-V2 Const. #72	1,035	5
6	CAT 6-47	RH-V2 Const. #72	RH-V2 Const. #73	2,898	17
6	CAT 6-48	RH-V2 Const. #73	RH-V2 Const. #74	710	3
6	CAT 6-49	RH-V2 Const. #74	RH-V2 Const. #75	1,001	5
6	CAT 6-50	RH-V2 Const. #75	RH-V2 Const. #76	1,573	9
6	CAT 6-51	RH-V2 Const. #76	RH-V2 Const. #77	1,070	5
6	CAT 6-52	RH-V2 Const. #77	RH-V2 Const. #78	1,336	7
6	CAT 6-53	RH-V2 Const. #78	RH-V2 Const. #79	2,904	17
6	CAT 6-54	RH-V2 Const. #79	RH-V2 Const. #80	1,512	9
6	CAT 6-55	RH-V2 Const. #81	RH-V2 Const. #82	756	5
6	CAT 6-56	RH-V2 Const. #84	RH-V2 Const. #85	1,043	5
6	CAT 6-57	RH-V2 Const. #85	RH-V2 Const. #86	1,828	11
6	CAT 6-58	RH-V2 Const. #86	RH-V2 Const. #87	1,867	11
6	CAT 6-59	RH-V2 Const. #87	RH-V2 Const. #88	1,752	9
6	CAT 6-60	RH-V2 Const. #88	RH-V2 Const. #89	980	5
6	CAT 6-61	RH-V2 Const. #89	RH-V2 Const. #90	1,712	9
6	CAT 6-62	RH-V2 Const. #90	RH-V2 Const. #91	2,279	13
6	CAT 6-63	RH-V2 Const. #91	RH-V2 Const. #92	876	5
6	CAT 6-64	RH-V2 Const. #93	RH-V2 Const. #94	1,508	9
6	CAT 6-65	RH-V2 Const. #95	RH-V2 Const. #96	1,412	7
6	CAT 6-66	RH-V2 Const. #96	RH-V2 Const. #97	1,791	9
6	CAT 6-67	RH-V2 Const. #99	RH-V2 Const. #100	2,543	15
6	CAT 6-68	RH-V2 Const. #100	RH-V2 Const. #101	1,728	9
6	CAT 6-69	RH-V2 Const. #103	RH-V2 Const. #104	1,878	11
6	CAT 6-70	RH-V2 Const. #105	RH-V2 Const. #106	1,019	5
6	CAT 6-71	RH-V2 Const. #106	RH-V2 Const. #107	2,399	13
6	CAT 6-72	RH-V2 Const. #107	RH-V2 Const. #108	752	5
6	CAT 6-73	RH-V2 Const. #108	RH-V2 Const. #109	1,037	5
6	CAT 6-74	RH-V2 Const. #109	RH-V2 Const. #110	1,563	9
6	CAT 6-75	RH-V2 Const. #110	RH-V2 Const. #111	1,513	9
6	CAT 6-76	RH-V2 Const. #112	RH-V2 Const. #113	2,397	13
6	CAT 6-77	RH-V2 Const. #113	M27-T2	1,543	9
7	CAT7-1	M27-T2	M27-T3	1,558	9
7	CAT7-2	M27-T3	M27-T4	1,470	9
7	CAT7-3	M27-T4	M28-P1	1,650	9
7	CAT7-4	M29-T3	M29-T4	1,105	7
7	CAT7-6	M29-T5	M30-T1	979	5
7	CAT7-7	M30-T1	M30-T2	935	5
7	CAT7-8	M31-T2	M31-T3	976	5
7	CAT7-9	M31-T3	M31-T4	1,841	11

Table 2.3-1. Transmission Line Span Marking Recommendations by the FAA

Segment-Phase	Structure Name	Adjacent Transmission Structures (Transmission Line Spans Only)		Span Length (feet)	Approximate Number of Marker Balls
7	CAT7-10	M31-T4	M32-T1	1,168	7
7	CAT7-11	M32-T1	M32-T2	581	3
7	CAT7-12	M32-T2	M32-T3	1,293	7
7	CAT7-13	M32-T3	M32-T4	1,022	5
7	CAT7-14	M32-T4	M32-T5	1,959	11
7	CAT7-15	M32-T5	M32-T6	300	1
7	CAT7-17	M34-T1	M34-T2	1,120	7
7	CAT7-18	M34-T2	M34-T3	1,024	5
7	CAT7-19	M34-T3	M34-T4	1,084	7
7	CAT7-20	M34-T4	M34-T5	1,088	7
7	CAT7-22	M35-T2	M35-T3	1,263	7
7	CAT7-23	M35-T3	M35-T4	686	3
7	CAT7-24	M35-T4	M35-T5	725	5
7	CAT7-25	M36-T2	M36-T3	1,281	7
7	CAT7-26	M36-T3	M36-T4	1,476	9
7	CAT7-27	M37-T2	M37-T3	1,206	7
7	CAT7-28	M37-T3	M37-T4	1,689	9
7	CAT7-29	M37-T4	M38-T1	1,259	7
7	CAT7-31	M39-T4	M39-T5	1,355	7
7	CAT7-32	M39-T5	M40-T1	1,259	7
7	CAT7-33	M40-T2	M40-T3	1,625	9
7	CAT7-34	M40-T3	M40-T4	641	3
7	CAT7-35	M40-T5	M41-T1	1,028	5
7	CAT7-36	M41-T4	M41-T5	1,270	7
7	CAT7-37	M41-T5	M42-T1	1,161	7
7	CAT7-38	M42-T1	M42-T2	1,359	7
7	220 Seg7 Cat1 (Installed)	M54-T1	M54-T2	1,450	9
7	220 Seg7 Cat2 (Installed)	M54-T2	M54-T3	1,632	9
7	220 Seg7 Cat3 (Installed)	M54-T3	M54-T3A	1,559	9
8-1	Cat8p1-1	M55-T2	M56-T1	905	5
8-1	Cat8p1-2	M56-T1	M56-T2	852	5
8-1	Cat8p1-3	M56-T2	M56-T3	1,172	7
8-1	Cat8p1-4	M56-T3	M56-T4	1,684	9
8-1	Cat8p1-5	M56-T4	M57-T1	2,955	17
8-1	Cat8p1-6	M57-T1	M57-T2	664	3
8-1	Cat8p1-7	M57-T2	M57-T3	1,640	9
8-1	Cat8p1-8	M57-T3	M57-T4	1,239	7
8-1	Cat8p1-9	M57-T4	M58-T1	2,189	13
8-1	Cat8p1-10	M58-T2	M58-T3	900	5
8-1	Cat8p1-11	M58-T3	M59-T1	2,332	13
8-1	Cat8p1-12	M59-T1	M59-T2	1,880	11
8-1	Cat8p1-13	M59-T2	M59-T3	2,363	13
8-1	Cat8p1-14	M59-T3	M60-T1	2,480	13
8-1	Cat8p1-15	M60-T2	M60-T3	2,009	11
8-1	Cat8p1-16	M60-T3	M61-T1	1,066	5
8-1	Cat8p1-17	M62-T2	M62-T3	1,422	7
8-1	Cat8p1-18	M62-T4	M62-T5	1,459	9
8-1	Cat8p1-19	M62-T5	M63-T1	1,796	9
8-4	Seg8.4 CAT1	M40-T4	M40-T5	922	5
8-4	Seg8.4 CAT3	M42-T5	M42-T5A	377	3
8-4	Seg8.4 CAT4	M42-T5A	M42-T6	618	3

Table 2.3-1. Transmission Line Span Marking Recommendations by the FAA

Segment-Phase	Structure Name	Adjacent Transmission Structures (Transmission Line Spans Only)		Span Length (feet)	Approximate Number of Marker Balls
8-4	Seg8.4 CAT5	M42-T6	M42-T7	458	3
8-4	Seg8.4 CAT6	M42-T7	M43-T1	809	5
8-4	Seg8.4 CAT7	M43-T1	M43-T2	2,435	13
8-4	Seg8.4 CAT8	M47-T2	M47-T3	1,137	7
8-4	Seg8.4 CAT9	M47-T3	M47-T4	1,947	11
8-4	Seg8.4 CAT10	M47-T4	M48-T1	1,502	9
8-4	Seg8.4 CAT11	M48-T2	M48-T3	1,572	9
8-4	Seg8.4 CAT12	M48-T3	M48-T4	1,383	7
8-4	Seg8.4 CAT13	M48-T4	M49-T1	1,245	7
8-4	Seg8.4 CAT14	M49-T1	M49-T2	1,223	7
8-4	Seg8.4 CAT15	M49-T2	M49-T3	1,648	9
8-4	Seg8.4 CAT16	M49-T3	M49-T4	1,036	5
8-4	Seg8.4 CAT17	M49-T4	M50-T1	1,090	7
8-4	Seg8.4 CAT18	M50-T1	M50-T2	1,798	9
8-4	Seg8.4 CAT19	M50-T2	M50-T3	924	5
8-4	Seg8.4 CAT20	M50-T3	M50-T4	2,000	11
8-4	Seg8.4 CAT21	M50-T4	M51-T1	1,869	11
8-4	Seg8.4 CAT22	M51-T1	M51-T2	1,142	7
8-4	Seg8.4 CAT23	M51-T2	M51-T3	332	1
8-4	Seg8.4 CAT24	M51-T3	M51-T4	1,116	7
8-4	Seg8.4 CAT25	M51-T4	M51-T5	646	3
8-4	Seg8.4 CAT26	M51-T5	M52-T1	846	5
8-4	Seg8.4 CAT27	M52-T1	M52-T2	1,345	7
8-4	Seg8.4 CAT28	M52-T2	M52-T3	916	5
8-4	Seg8.4 CAT29	M52-T3	M52-T4	947	5
8-4	Seg8.4 CAT30	M52-T4	M52-T5	1,355	7
8-4	Seg8.4 CAT31	M52-T5	M53-T1	2,402	13
8-4	Seg8.4 CAT32	M53-T1	M53-T2	1,524	9
8-4	Seg8.4 CAT33	M53-T2	M53-T3	650	3
8-4	Seg8.4 CAT34	M53-T3	M54-T1	2,835	15
8-4	Seg8.4 CAT35	M54-T1	M54-T2	1,633	9
8-4	Seg8.4 CAT36	M54-T2	M54-T3	1,358	7
8-4	Seg8.4 CAT37	M54-T3	M55-T1	1,941	11
8-4	Seg8.4 CAT38	M55-T1	M55-T2	3,020	17
8-4	Seg8.4 CAT39	M9-T4	M9-T3A	599	3
8-4	Seg8.4 CAT40	M9-T3A	M9-T3	485	3
8-4	Seg8.4 CAT41	M9-T3	M9-T2	383	3
8-4	Seg8.4 CAT42 (Installed)	M4-T1	M3-T3A	1,496	9
8-4	Seg8.4 CAT43	M3-T1	M2-T4A	1,207	7
8-4	Seg8.4 CAT44	M2-T4A	M2-T4	1,225	7
8-4	Seg8.4 CAT45 (Installed)	MA1-T2	MA1-T1	1,208	7
8-4 (Rose Hills)	T/L M5-T1/M4-T3	M4-T3	M5-T1	1,336	7
8-4 (Rose Hills)	T/L M5-T1A/M5-T1 (Installed)	M5-T1	M5-T1A	1,148	7
8-4 (Rose Hills)	T/L M6-T1/M5-T3	M5-T3	M6-T1	2,058	11
8-4 (Rose Hills)	T/L M6-T2/M6-T1	M6-T1	M6-T2	1,831	11
8-4 (Rose Hills)	T/L M6-T3/M6-T2	M6-T2	M6-T3	1,518	9
8-4 (Rose Hills)	T/L M7-T1/M6-T3	M6-T3	M7-T1	880	5
8-4 (Rose Hills)	T/L M7-T2B/M7-T2A	M7-T2A	M7-T2B	1,506	9
8-4 (Rose Hills)	T/L M8-T1A/M8-T2	M8-T1	M8-T1A	640	3
8-4 (Rose Hills)	T/L M43-T2/M43-T3	M43-T2	M43-T3	2,108	11
8-4 (Rose Hills)	T/L M44-T2/M44-T3	M44-T2	M44-T3	924	5

Table 2.3-1. Transmission Line Span Marking Recommendations by the FAA

Segment-Phase	Structure Name	Adjacent Transmission Structures (Transmission Line Spans Only)		Span Length (feet)	Approximate Number of Marker Balls
8-4 (Rose Hills)	T/L M44-T3/M44-T4	M44-T3	M44-T4	1,444	9
8-4 (Rose Hills)	T/L M45-T2/M45-T3	M45-T2	M45-T3	875	5
8-4 (Rose Hills)	T/L M45-T3/M45-T4	M45-T3	M45-T4	1,431	7
8-4 (Rose Hills)	T/L M45-T4/M45-T5	M45-T4	M45-T5	1,965	11
8-4 (Rose Hills)	T/L M45-T5/M46-T1	M45-T5	M46-T1	2,016	11
8-4 (Rose Hills)	T/L M46-T1/M46-T2	M46-T1	M46-T2	1,421	7
8-4 (Rose Hills)	T/L M46-T3/M47-T1	M46-T3	M47-T1	1,123	7
8-4 (Rose Hills)	T/L M47-T1/M47-T2	M47-T1	M47-T2	1,388	7
11B	Seg11-Cat1	M0-T1	M0-T2	732	5
11B	Seg11-Cat2	M0-T3	M0-T4	2,740	15
11B	Seg11-Cat3	M0-T4	M1-T1	1,443	9
11B	Seg11-Cat4	M1-T1	M1-T2	1,066	5
11B	Seg11-Cat5	M1-T2	M1-T3	1,441	9
11B	Seg11-Cat6	M1-T3	M1-T4	2,063	11
11B	Seg11-Cat7	M2-T1	M2-T2	2,088	11
11B	Seg11-Cat8	M2-T2	M2-T3	1,882	11
11B	Seg11-Cat9	M2-T3	M3-T1	1,926	11
11B	Seg11-Cat10	M3-T1	M3-T2	518	3
11B	Seg11-Cat11	M3-T2	M3-T3	2,592	15
11B	Seg11-Cat12	M3-T3	M4-T1	2,181	13
11B	Seg11-Cat13	M4-T1	M4-T2	1,411	7
11B	Seg11-Cat14	M4-T3	M5-T1	1,744	9
11B	Seg11-Cat15	M5-T1	M5-T2	2,603	15
11B	Seg11-Cat16	M5-T2	M5-T3	1,860	11
11B	Seg11-Cat17	M5-T3	M6-T1	1,113	7
11B	Seg11-Cat18	M6-T1	M6-T2	1,945	11
11C	Seg11C-Cat4	1	2	1,452	9
11C	Seg11C-Cat6	3	4	1,208	7
11C	Seg11C-Cat8	5	6	1,362	7
11C	Seg11C-Cat9	6	7	1,784	9
11C	Seg11C-Cat13	12	13	1,114	7
11C	Seg11C-Cat14	13	14	872	5
11C	Seg11C-Cat15	14	15	2,497	13
11C	Seg11C-Cat16	15	16	677	3
11C	Seg11C-Cat17	16	17	608	3
11C	Seg11C-Cat19	21	22	1,811	11
11C	Seg11C-Cat20	22	23	1,613	9
11C	Seg11C-Cat21	23	24	1,654	9
11C	Seg11C-Cat22	25	26	1,181	7
11C	Seg11C-Cat23	26	27	872	5
11C	Seg11C-Cat24	28	29	2,050	11
11C	Seg11C-Cat25	29	30	1,729	9
11C	Seg11C-Cat27	31	32	1,307	7
11C	Seg11C-Cat28	32	33	2,155	11
11C	Seg11C-Cat31	35	36	897	5
11C	Seg11C-Cat32	36	37	1,575	9
11C	Seg11C-Cat33	39	40	1,360	7
11C	Seg11C-Cat35	42	43	903	5
11C	Seg11C-Cat36	44	45	1,807	11
11C	Seg11C-Cat37	45	46	2,678	15
11C	Seg11C-Cat41	52	53	3,633	21

Table 2.3-1. Transmission Line Span Marking Recommendations by the FAA

Segment-Phase	Structure Name	Adjacent Transmission Structures (Transmission Line Spans Only)		Span Length (feet)	Approximate Number of Marker Balls
11C	Seg11C-Cat42	54	55	1,267	7
11C	Seg11C-Cat43	55	56	1,587	9
11C	Seg11C-Cat44	56	57	986	5
11C	Seg11C-Cat45	57	58	1,276	7
11C	Seg11C-Cat46	58	59	2,842	15
11C	Seg11C-Cat48	61	62	2,258	13
11C	Seg11C-Cat49	62	63	2,543	15
11C	Seg11C-Cat50	63	64	2,911	17
11C	Seg11C-Cat51	64	65	2,961	17
11C	Seg11C-Cat52	65	66	1,946	11
11C	Seg11C-Cat53	66	67	3,042	17

Source: SCE, 2012b – Table 2.4-2.
1 - In Segment 6, approximately five miles of the existing Rio-Hondo–Vincent No. 2 220-kV T/L would be rebuilt from Vincent Substation to the existing cross-over span (S6 MP 4.8), parallel to the Antelope – Mesa 220-kV T/L structures that would be rebuilt from Vincent Substation to the southern boundary of the ANF.
2 - Segment 8 is defined in four phases, as follows (from west to east): Phase 4 (8-4) was previously Segment 8A from the San Gabriel Junction to Diamond Bar; Phase 1 (8-1) was Segment 8A from Diamond Bar to Central Avenue in Chino; Phase 3 (8-3) was previously Segment 8A/8C; and Phase 2 (8-2) was previously Segment 8B. Marker balls have not been recommended for any of the spans within Segments 8-2 or 8-3.
3 - Segment 11C extends from Vincent Substation to Gould Substation; 11B extends from Gould Substation to the ANF boundary in Altadena.

2.3.1.1 Installation by Helicopter

Marker balls would primarily be installed utilizing a light-duty helicopter. Installation by helicopter may require an outage that de-energizes nearby energized subtransmission lines and T/Ls. The number of helicopter trips needed to install the marker balls is relatively small compared to the number of helicopter trips needed for the construction of TRTP structures and conductor. However, trips are defined differently for the Approved Project activities (wreck-out and installation of structures and conductor) than the Project modification activities (installation of marker balls); therefore, it is more accurate to compare the number of hours of helicopter use. Tables 2.3-2 and 2.3-3 present a comparison of the maximum daily and total hours of helicopter use for the Approved Project and the Project modifications.

Table 2.3-2. Maximum Daily Hours of Helicopter Use

Helicopter Type	Working Hours	Idle Hours	Total Hours
Project Modifications			
530F	7	3	10
Approved Project			
Hughes 500[1]	5	0.5	5.5
Eurocopter[2]	147	15	162
Skyking[2]	62	6	68
Skycrane[2]	5	0	5
Project Total (w/o Project Modifications)[3]			241
Project Total (with Project Modifications[3]			251

Source: SCE, 2012a, Q11-3, Table 11-3.1.
1 - The Hughes 500 helicopter is only used for conductor stringing. Hours of use are based on the calculations performed for the Final EIR and Final EIS, which assumed two helicopters in operation during line stringing for 2.5 hours per day each. It was assumed that stringing would occur on no more than one segment at a time.
2 - The Eurocopter, Skyking, and Skycrane are used for construction and wreck-out activities. Maximum daily hours of use are from the Final EIR and Final EIS maximum daily helicopter emission calculations.
3 - Hours have been rounded up to the nearest whole number.

Table 2.3-3. Total Hours of Helicopter Use

Helicopter Type	Working Hours	Idle Hours	Total Hours
Project Modifications[1]			
530F	828	355	1,183
Approved Project			
Hughes 500[2]	4,915	492	5,407
Eurocopter[3]	6,080	608	6,688
Skyking[3]	2,464	246	2,710
Skycrane[3]	512	0	512
Project Total (w/o Project Modifications)			15,317
Project Total (with Project Modifications)			16,500

Source: SCE, 2012a, Q11-3, Table 11-3.2.

1 - Assumes 2,365 marker balls installed. This number was approximated given the received and pending FAA recommendations as of July 2012. At that time, all pending FAA recommendations were assumed to require marking. This estimate is slightly higher than would be required for the current estimate of 2,248 marker balls, which is based on the FAA's final set of recommendations.

2 - Total hours of use were taken from the calculations performed for the Final EIR and Final EIS.

3 - Assumes total project helicopter construction of 96 towers and helicopter wreck-out of 96 towers per construction schedule information available as of March 2012.

Helicopter installation requires staging at a landing zone where the helicopter would pick up the construction worker and a marker ball and travel to the installation location. Existing areas previously approved for helicopter support for the Approved Project, such as roads, contractor/material yards, wire set-up sites, structure work areas, crane pads, staging areas, and general disturbance areas, would be used to support installation of equipment required by the FAA.

Water may be necessary for dust suppression at the unpaved landing zones, marker ball installation locations, and access areas. The amount of water for dust suppression associated with the Project modifications would vary from a total of 0 to 7,500 gallons per day north and south of the ANF and from a total of 0 to 12,500 gallons per day inside the ANF, depending on the elevation of the overhead ground wire and on the terrain at the landing zones, marker ball installation locations, and access areas. Overall, the TRTP is expected to use approximately 82-109 million gallons of water (SCE, 2013c).

To install the marker balls, the helicopter will hover next to the T/L for approximately 15 to 20 minutes while the marker ball and associated hardware is put in place on the overhead ground wire. Upon reaching the installation location on the ground wire, the construction worker will attach the marker ball to the overhead ground wire in a secure manner. The total installation time for marker balls utilizing the helicopter installation method, including helicopter time to and from the landing zone and installation on the overhead ground wire, varies by region of the Project. The total installation time will also vary slightly from the average for each marker ball, depending on the distance between the installation location and the relevant landing zone. In the more populated Northern and Southern Regions of the TRTP, approximately 1.5 marker balls could be installed per hour. However, approximately two marker balls per hour could be installed in the Central Region (ANF) because of increased access to approved helicopter landing zones. In one work day, which is typically ten hours, a single helicopter installation crew may be able to install between 15 and 20 marker balls. SCE may operate several helicopter installation crews at one time at a suitable distance apart to maintain construction safety (SCE, 2011b).

2.3.1.2 Installation by Spacer Cart

In limited circumstances, SCE would utilize a spacer cart (wheeled carrier) to install marker balls and associated hardware on the ground wire. Use of this method is only anticipated by SCE to be needed in Segments 7 and 8, in the rare event that helicopter installation is rendered infeasible due to constraints (e.g., FAA congested air plan, proximity to residences, and/or buffers around Environmentally Sensitive Areas) (SCE, 2012a, Q11-1). Use of spacer carts is also limited in that it can only be utilized in locations where overhead ground wire is installed, not optical ground wire due to the risk of damaging the fiber optics (SCE, 2012a, Q11-1). No spans have been identified within Segments 7 or 8 that require SCE to restrict the use of helicopters.

If required, the spacer cart would be installed on the ground wire manually by installation crews, either by helicopter or by using a crane at a transmission structure location on an existing crane pad created during construction of the structure. Installation of spacer carts by crane would take place during construction of the transmission structures; therefore, it is not expected that use of spacer carts will require any additional ground disturbance. It would take approximately 60 to 90 minutes to install and remove the spacer cart (either by helicopter or crane). A construction worker would use the installed spacer cart to travel along the ground wire to install the marker balls one at a time. Under this method, installation of marker balls would proceed at a rate of two to five marker balls per day per spacer cart team.

2.3.2 Lighting of Transmission Structures

Per the FAA's recommendations, SCE proposes to install aviation lighting on 90 transmission structures following FAA Advisory Circular, Obstruction Marking and Lighting, AC No. 70/7460-1K, Change 2 (Effective 2/1/07). Figures 2.1-1a through 2.1-1j, provided at the end of this section, identify the transmission structures where lighting is recommended. (Note: To avoid potential safety issues, a few transmission structures have already had lights installed, as the structure was completed prior to receiving FAA recommendations. These are denoted as "FAA Conditions Met with Red Light Installed.) Table 2.3-4 lists the transmission structures that the FAA determined need aviation lights to ensure safe and efficient utilization of the navigable airspace by aircraft and operation of air navigation facilities. Ground-based construction crews would install the lights, although helicopter crews may be appropriate in certain circumstances. For example, helicopter construction may be required on Segment 11 for structures Const. 14, 16, and 17 on NFS lands. There would be two light sets on each of these three structures (two L-810 – treated as one set; one L-864) for a total of six light sets, where each light set would require six helicopter trips for a total of 36 trips (SCE, 2013c). Where feasible, lighting would be installed on a transmission structure as it is being constructed. (Note: The CPUC has issued a construction stay for Segment 8A within the City of Chino Hills, which will continue until the CPUC makes a final determination on undergrounding options; Segment 8A undergrounding options are not the subject of this SEIR/SEIS.)

Table 2.3-4. Transmission Structure Lighting Recommendations by the FAA

Segment-Phase	Structure Name	Structure Type
5	Structure 40	LST
5	Structure 41	LST
5	Structure 42	LST
5	Structure 43	LST
5	Structure 44	LST
5	Structure 45	LST
5	Structure 46	LST
5	Structure 47	LST
5	Structure 48	LST
5	Structure 49	LST
5	Structure 70 (Installed)	TSP
6	Const. #1	LST
6	Const. #2	LST
7	M27-T2	LST

Table 2.3-4. Transmission Structure Lighting Recommendations by the FAA

Segment-Phase	Structure Name	Structure Type
7	M27-T4 (Installed)	LST
7	M29-T4	LST
7	M29-T5	LST
7	M30-T1	LST
7	M31-T3 (Installed)	LST
7	M31-T4	LST
7	M32-T2	LST
7	M32-T3	LST
7	M32-T4	LST
7	M32-T5	LST
7	M34-T2	LST
7	M34-T3	LST
7	M34-T4	LST
7	M35-T2	LST
7	M35-T3	LST
7	M35-T4	LST
7	M36-T3	LST
7	M37-T3	LST
7	M37-T4	LST
7	M39-T5	LST
7	M40-T3	LST
7	M41-T5	LST
7	M54-T3A (Installed)	LST
10	Structure 92 (Installed)	LST
8-1	M57-T3 (Installed)	LST
8-2	M0-T4 (Installed)	LST
8-2	M0-T5 (Installed)	LST
8-2	M0-T6 (Installed)	LST
8-2	M1-T1 (Installed)	LST
8-2	M1-T2 (Installed)	LST
8-2	M1-T3 (Installed)	LST
8-2	M1-T4 (Installed)	LST
8-2	M2-T1 (Installed)	LST
8-2	M2-T2 (Installed)	LST
8-2	M2-T3	LST
8-2	M2-T4	LST
8-2	M2-T5	LST
8-3	M66-T8	LST
8-3	M67-T1	LST
8-3	M67-T2	TSP
8-3	M67-T3	TSP
8-3	M67-T4	LST
8-3	M67-T5	TSP
8-3	M68-T1	LST
8-3	M68-T2	TSP
8-3	M68-T3	TSP
8-3	M68-T4	TSP
8-3	M68-T5	TSP
8-3	M69-T1	TSP
8-3	M69-T2	TSP
8-3	M69-T3	TSP
8-3	M69-T4	TSP

Table 2.3-4. Transmission Structure Lighting Recommendations by the FAA

Segment-Phase	Structure Name	Structure Type
8-3	M69-T5	TSP
8-3	M70-T1	TSP
8-3	M70-T2	TSP
8-3	M70-T3	TSP
8-3	M70-T4	LST
8-3	M70-T5	TSP
8-3	M70-T6	TSP
8-4	M42-T5	LST
8-4	M42-T5A	LST
8-4	M42-T6	LST
8-4	M42-T7	LST
8-4	M50-T4	LST
8-4	M51-T4	LST
8-4	M52-T1	LST
8-4	M9-T3A	LST
8-4	M9-T3	LST
11C	M32-T4X	LST
11C	1	LST
11C	2	LST
11C	5	LST
11C	14	LST
11C	15	LST
11C	16	LST
11C	17	LST

Source: SCE, 2012c.

2.3.2.1 FAA Lighting Types

SCE anticipates the installation of two possible types of FAA-compliant obstruction lighting: L-810 lights or L-864 lights. The L-810 light is a steady-burning red light with an approximately 360 degree minimum intensity of 32.5 candela, which would be visible for approximately 1.4 statute miles (statute mile = 5,280 linear feet) or approximately 1.0 meteorological visibility statute mile (a.k.a. air mile, where 1 statute mile = 0.87 air mile) (FAA, 2007 – Appendix 2). The light fixture is approximately 6 to 12 inches tall and 5 inches in diameter. In some cases, two L-810 light fixtures may be installed together for redundancy. The L-864 light is a flashing red light with a flash rate of 20 to 40 flashes per minute. It has an approximately 360 degree peak intensity of 2,000 candela, plus or minus 25 percent, which would be visible for approximately 3.1 statute miles or approximately 3.0 air miles (FAA, 2007 – Appendix 2). The light fixture is approximately 9 inches tall and 14 inches in diameter. Both types of lights are expected to use light emitting diodes (LED) instead of incandescent light bulbs to minimize size, weight and power consumption. The L-810 and L-864 lights have focused beacons which would direct light upward and outward toward potential aviation traffic without creating illumination of nearby areas.

Two possible lighting scenarios for transmission structures (LSTs and TSPs) are considered as part of the proposed modifications:

(1) For transmission structures that are 150 feet or shorter (A0 Style), SCE would place one steady-burning red L-810 light at the top of the structure, consistent with FAA's recommendations (see Figure 2.3-1); and

(2) For transmission structures between 151 to 300 feet tall (A1 Style), SCE would install one flashing red L-864 light at the top, in addition to two steady-burning red L-810 lights midway up the transmission structure, as recommended by the FAA (see Figure 2.3-2). As noted above, SCE may install two lights at each position on the structure for redundancy.

2.3.2.2 Lighting Power Sources

Power for the FAA lighting would be provided by (1) installing photovoltaic (solar) panels, or (2) running a 120/240-volt distribution line to each transmission structure requiring lighting. The majority would utilize photovoltaic solar technology to minimize ground disturbance and minimize impacts to sensitive species. Where SCE already has underground vaults or overhead distribution lines directly adjacent to the transmission structure, distribution power would be considered.

Solar Power

Solar-powered lights require panels of photovoltaic cells to charge a battery pack (see Figure 2.3-3). The size of these panels would be approximately 10 to 12.5 square feet and 2 to 3 inches thick. The transmission structure's orientation and access to sunlight affects the size of the photovoltaic panels and batteries needed to provide power to the lights; therefore, depending on the power needs, one to three panels may be needed at each location. The battery pack would also vary in size, with the largest battery sized at approximately 40 inches long, 30 inches wide, and 16 inches high.

A separate control unit would control the power, battery charging, and on-off cycles of the lights. The control unit would vary in size, with the largest unit sized at approximately 18 inches long, 10 inches wide, and 18 inches high. In addition, a separate monitoring and communications system may be needed to provide continuous status monitoring and notification in the event of a light malfunction.

For transmission structures requiring only a steady-burning L-810 light (Scenario 1), the light, control unit enclosure, communications system enclosure, photovoltaic panels, and battery may be mounted together (as close to each other as possible) on metal brackets securely attached near the top of the transmission structure (see Figures 2.3-1 and 2.3-4(b)). For transmission structures requiring a flashing L-864 and two steady-burning L-810 lights midway up the structure (Scenario 2), SCE proposes to install the lights individually, separate from the control unit enclosure and the communications system enclosure. The lights would be securely attached to the transmission structure by metal brackets with the control unit enclosure and the communications system enclosure mounted with a metal bracket separately lower on the transmission structure. The exact placement of these components would vary (see Figure 2.3-2). Figure 2.3-4(b) provides an example of a the solar powered lighting system physically installed on an existing tower.

Alternatively, based on transmission structure characteristics, in certain circumstances the control unit enclosure and the communications system enclosure may be located on the ground at the base of the transmission structure or at the edge of the ROW (see Figures 2.3-2 and 2.3-4(a)). The peripheral hardware, including the battery pack, the control unit enclosure, photovoltaic panels, and the communications system enclosure, may be mounted on one or two ground-based poles approximately 15 to 20 feet tall under or near the transmission structure base. If placed on the ground, the peripheral hardware would be surrounded by an approximately eight-foot-tall chain link fence with top-mounted barbed wire to deter vandals. The ground-based poles and peripheral solar hardware would be dull galvanized steel along with the chain link fence, if applicable; communication enclosures are generally off-white or beige in color (SCE, 2013a).

The need to provide alternate locations for FAA lighting equipment enclosures is driven by several factors. Primarily, solar panels, which are the only power source for many of the structure locations, require a southern facing exposure for best solar insolation. Additionally, maintenance access to the panels and enclosures is required. In hilly or mountainous terrain, or locations where full access to the tower legs is inhibited, sunlight and access may be negatively impacted, which may make ground-mounted equipment more feasible. (SCE, 2012a – Q11-5) However, ground installation of peripheral hardware would not occur in sensitive environmental areas. For example, SCE has confirmed that on NFS lands solar panels would be installed on the transmission structures (SCE, 2013c).

Distribution Power

Use of distribution power would be viable where SCE already has underground vaults or overhead distribution lines directly adjacent to the transmission structure requiring aviation lights. As such, SCE would consider using distribution circuits to power aviation lights when a structure is located inside of, or directly adjacent to, a substation or distribution circuit(s) (SCE, 2013a). Distribution power would not be used in biologically sensitive areas.

Distribution power would consist of taking a single-phase line extension off of an existing source and routing it along the ROW. The distribution line would be routed via underground conduits or short overhead lines from nearby distribution poles. Installing distribution power requires underground conduits with 120 volt power cables; the length of the cables depends on the proximity of the transmission structure to the closest distribution line, but is typically less than 200 feet (SCE, 2013a). The conduits would need a trench that is 8 to 12 inches wide and 18 to 48 inches deep (SCE, 2013a). A control unit would control the power and on-off cycles of the lights. A separate monitoring and communications system may be needed to provide continuous status monitoring and logging for the lights, and would reside within an additional enclosure similar in size to the control unit enclosure (maximum size: 18 inches long, 30 inches wide, 16 inches high).

2.3.3 Maintenance of Marker Balls and Lighting

SCE would incorporate inspections and necessary maintenance of marker balls during existing inspections. Visual inspections of T/Ls and structures are conducted by SCE once a year; comprehensive inspections are performed once every two years. Marker balls are expected to last from 10 to 25 years; however, individual circumstance may require some to be replaced sooner, such as vandalism or extreme weather loading (SCE, 2012c). It is assumed that marker balls would be replaced up to four times during the 50-year lifespan of the Project. Marker ball replacement would occur utilizing the same method as initial installation, which for the majority of the marker balls would occur by helicopter. For aviation lights, SCE proposes to install a "monitoring and communications system" or notification system that is integrated into the lighting devices that would alert SCE of the need for maintenance or replacement of lights.

2.3.4 Potential Replacement of Ground Wire

As part of the Approved Project, interset towers would be installed along some of the existing T/L alignment to control swing and rise, preventing interference with the new TRTP T/L structures and conductor. In some cases, the installation of the interset tower results in the need to submit a FAA Form 7460-1 for both the modified tower and catenary (wire span) along the existing line. If the FAA determines that markings (i.e., marker balls) are warranted for the modified tower and span, then replacement of the overhead ground wire (OHGW) may be needed. Based on the FAA's determinations for the TRTP, OHGW would need to be replaced with optical ground wire (OPGW), which is a specialized form of OHGW that contains optical fiber strands within a central core surrounded by the steel strands of the ground wire, to allow for the installation of marker balls along Segments 6 and 11. OHGW would be replaced with OPGW in Segment 6 on the Rio Hondo Vincent #1 T/L from Structure M31-P1 to M31-T2 (Const. 19-20), M31-T2 to M31-T3 (Const. 20-21), and M31-T2 to M31-T3 (Cat 6-15) (SCE, 2013c). Additionally, in Segment 11B (Gould to Goodrich Substations), where the Approved Project would install new conductor in the vacant position on existing double-circuit structures, the FAA has recommended that marker balls be installed on 18 catenaries on NFS lands; however, SCE may file for relief from marking these catenaries due to the proximity of the existing structures to other structures and the topography near the structures (SCE, 2013c). If relief is granted, the marker balls would not be installed; no changes to the ground wire would be required. Where feasible, ground wire replacement would occur at the same time as wire pulling activities occurring as part of the Approved Project. SCE proposes to use the means and methods defined in Final EIR and/or Final EIS Section 2.2.12.11 (Information Technology Facility Construction) for the replacement of ground wire.

2.3.5 Engineering Refinements for Segment 8, Phase 3

In response to the FAA's concerns that certain transmission structures near the Chino Airport would interfere with the instrument approach procedure, SCE is proposing to reduce the height of 21 transmission structures by approximately 20 feet in Segment 8, Phase 3, as shown in Figure 2.1-1f (Note: Segment 8, Phase 3 was previously referred to as Segment 8A/8C in the Final EIR and Final EIS; Segment 8B is now referred to as Phase 2). The originally approved structure locations would be maintained.

The SCE Engineering Department determined that a combination of lowered TSPs and specially designed dead-end LSTs would allow for the lower height while maintaining the number of structures without any significant shift in structure locations. The proposed modifications include replacing the following seven TSPs with specially designed dead-end LSTs:

- M68-T5
- M69-T2
- M69-T5
- M70-T1
- M70-T3
- M70-T5
- M70-T6

TSPs cannot be used in these seven locations (see Figure 2.5-1 for tower locations) because lowering a TSP to the appropriate height results in a lower conductor ground clearance that would violate CPUC General Order 95 (GO 95), as shown in Figure 2.5-2. This is because insulators hang vertically on a TSP. In contrast, an LST's insulators hang horizontally. When an LST is lowered, the conductor maintains more distance from the ground. In other words, when a TSP is lowered to a certain height, the conductor moves closer to the ground than when an LST is lowered to the same height. LSTs can therefore meet the height limit recommended by the FAA and still maintain the ground clearance requirements of GO 95. The height of the TSPs and LSTs originally proposed along Segment 8, Phase 3 were 195 feet and 198 feet, respectively. With the FAA's recommendation to reduce structure heights by approximately 20 feet, the TSPs and LSTs would now range from approximately 175 to 178 feet in height.

Final engineering may identify additional structures that require refinements (i.e., changes or modifications to structure types or height), although none are expected to be necessary (SCE, 2012a, Q11-9), as well as lower or relocate unrelated facilities in or adjacent to the ROW to meet the required clearances in Segment 8, Phase 3. The facilities in Segment 8, Phase 3 in the cities of Chino and Ontario that would be impacted due to electrical clearances and the potential remedial action(s) include the following (SCE, 2012a, Q11-8; SCE, 2012b, Q12-9):

- Building, cattle shed, water tanks, and miscellaneous structures (9 total); reduce height 2-6 feet, remove, or relocate.
- Utility wire crossings (cable, telephone, other) (2 total); reduce height 8-11 feet, remove, underground, or relocate.
- Orchard/Ground (Hump) (2 total); Ground hump offset from centerline – possible removal and remove vertically to achieve Code Ground Clearance.
- SCE's 66-kV poles and multiple distribution CKT/under-build (7 total); Reduce height 8-11 feet, remove, underground, or relocate.
- Light pole (3 total); reduce height 4-7 feet, relocate, or remove.

2.3.6 Construction Details for the Proposed Modifications

Construction of the proposed modifications would be integrated in with the existing construction schedule for all segments, except Segment 11. Work on Segment 11 is projected to occur April 2014 through May 2015 with marker ball installation occurring September 1, 2014 through March 1, 2015. In general, marker balls would be installed after optical ground wire is installed and secured; aviation lights would be installed during or after installation of a structure (SCE, 2012b, Q12-11). Some structures and/or catenaries (wire spans) may require submittal of Notices to Airmen (NOTAMs) prior to installation of marker balls and/or lights. Due to field conditions, the possibility of outages on adjacent lines in the corridors, availability of final engineering, and delivery of materials, the timing of marker ball and/or light installation is expected to vary from during erection of a specific structure (lights), after installation of optical ground wire (marker balls), to during the construction period prior to energizing the line (lights and marker balls) (SCE, 2012b, Q12-11).

The assumptions provided below in Sections 2.3.6.1 and 2.3.6.2 formulate the basis of the impact analysis presented in Section 4 of this SEIR/SEIS.

2.3.6.1 Marker Ball Construction Details

As noted above in Section 2.3.1.1, existing areas previously approved for helicopter support for the Approved Project, such as roads, contractor/material yards, wire set-up sites, structure work areas, crane pads, staging areas, and general disturbance areas, would be used to support installation of equipment recommended by the FAA.

Each helicopter installation crew for marker balls would consist of seven specialized crew members. On-road vehicle use would result from truck and worker commute trips. It is assumed that on-road vehicles would travel a daily round trip distance of 60 miles on paved roads and 10 miles on unpaved roads; with the exception of the crew's personal vehicles, which are assumed to travel 60 miles on paved roads and only 0.1 mile on unpaved roads (assumes personal vehicles are staged before the dirt roads and would utilize other vehicles to access unpaved areas). Additional trucks required for marker ball installation would include (SCE, 2012a, Q11-10A.1):

- One mechanic/fuel truck,
- One haul truck,
- One monitor truck,
- One fire truck,
- Two water trucks,
- Two one-ton pickup trucks, and
- Three additional trucks.

Each of these trucks is assumed to travel 60 miles per day on paved roads and 10 miles per day on unpaved roads.

As discussed in Section 2.3.1.1 (Installation by Helicopter), in the more populated Northern and Southern Regions of the TRTP, approximately 1.5 marker balls could be installed per hour. However, approximately two marker balls per hour could be installed in the Central Region because of increased access to approved helicopter landing zones in the proximity of the Project alignment. In one work day, which is typically 10 hours, a single helicopter installation crew may be able to install between 15 and 20 marker balls per day. SCE may operate several helicopter installation crews at one time at a suitable distance apart to maintain construction safety.

2.3.6.2 Transmission Structure Lighting Construction Details

General construction assumptions for the installation of aviation lights include (SCE, 2012a, Q11-10A.2):

- Equipment (lights, solar panels, and battery) would be installed on transmission structure body after tower erected.
- The same specialized crew would wire/test all the towers and each tower would take one day.

- Lighting equipment would be installed on one tower per day.
- The specialized crew would work in the year 2013.

No additional off-road equipment or helicopters would be needed to install the aviation lights. The only new/ additional emissions associated with lighting installation activities would result from specialized tower crew commute trips and truck trips. The following assumptions formulate the basis for lighting installation activities (SCE, 2012a, Q11-10A.2):

- Each of the two specialized tower workers would travel a round trip distance of 60 miles on paved roads and 0.1 mile on unpaved roads per day (assumes personal vehicles are staged before the dirt roads and would utilize other vehicles to access unpaved areas).
- One light-duty ¾ ton truck would be required to transport the lighting equipment from the staging area to the site; light-duty truck is assumed to travel 60 miles on paved roads and 10 miles on unpaved roads.

2.4 Alternatives

This section provides a discussion of the alternatives to the Modified Project, including identification of the environmentally superior alternative as required by CEQA (State CEQA Guidelines §15126.6(e)(2)) and the NEPA Lead Agency preferred alternative (40 CFR 1502.14).

2.4.1 CEQA and NEPA Requirements for Alternatives

Both CEQA and NEPA provide guidance on selecting a reasonable range of alternatives for evaluation in an EIR and EIS. The CEQA and NEPA requirements for selection and analysis of alternatives are similar, thereby allowing the use of an alternatives screening and evaluation process that satisfies both State and federal requirements. The CEQA and NEPA requirements for selection of alternatives are described below.

2.4.1.1 CEQA

CEQA requires that an EIR describe a range of reasonable alternatives to the project, or to the location of the project, which could feasibly avoid or lessen any significant environmental impacts while substantially attaining the basic objectives of the project. An EIR should also evaluate the comparative merits of the alternatives. The key provisions of the State CEQA Guidelines (§15126.6) pertaining to the analysis of alternatives are summarized below:

- The discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly.
- The “no project” alternative shall be evaluated along with its impact. The “no project” analysis shall discuss the existing conditions at the time the notice of preparation is published, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services.
- The range of alternatives required in an EIR is governed by a “rule of reason”; therefore, the EIR must evaluate only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project.
- For alternative locations, only locations that would avoid or substantially lessen any of the significant effects of the project need be considered for inclusion in the EIR.
- An EIR need not consider an alternative whose effects cannot be reasonably ascertained and whose implementation is remote and speculative.

Alternatives usually take the form of reduced project size, different project design, suitable alternative project sites, or no project. The range of alternatives discussed in an EIR is governed by a “rule of reason” that requires the identification of only those alternatives necessary to permit a reasoned choice between the alternatives and the proposed project.

The range of feasible alternatives is selected and discussed in a manner to foster meaningful public participation and informed decision making. Among the factors that may be taken into account when addressing the feasibility of alternatives (as described in State CEQA Guidelines §15126.6(f)(1)) are environmental impacts, site suitability, economic viability, availability of infrastructure, general plan consistency, regulatory limitations, jurisdictional boundaries, and whether the proponent could reasonably acquire, control, or otherwise have access to an alternative site. An EIR need not consider an alternative whose effects could not be reasonably identified, whose implementation is remote or speculative, and that would not achieve the basic project objectives.

In order to comply with CEQA's requirements, each alternative to the Modified Project has been evaluated in the following three ways:

- Does the alternative accomplish all or most of the basic project objectives?
- Is the alternative feasible (from economic, environmental, legal, social, technological standpoints)?
- Does the alternative avoid or substantially lessen any significant effects of the Modified Project (including consideration of whether the alternative itself could create significant effects greater than those of the Modified Project)?

Consistency with Project Objectives

The State CEQA Guidelines (§15126.6(b)) require the consideration of alternatives capable of eliminating or reducing significant environmental effects even though they may "impede to some degree the attainment of project objectives." Therefore, it is not required that each alternative meet all of the project objectives.

As discussed in Final EIR Section 1.2 (Purpose and Need), the Project's three primary objectives are to:

- Provide the electrical facilities necessary to reliably interconnect and integrate in excess of 700 MW[1] and up to approximately 4,500 MW of new wind generation in the TWRA currently being planned or expected in the future, thereby enabling SCE and other California utilities to comply with the California RPS goals in an expedited manner (i.e., 20 percent renewable energy by year 2010 per California Senate Bill 107).[2]
- Further address the reliability needs of the CAISO-controlled grid due to projected load growth in the Antelope Valley.
- Address the South of Lugo transmission constraints, an ongoing source of concern for the Los Angeles Basin.

Feasibility

The State CEQA Guidelines (§15364) define feasibility as:

> *. . . capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.*

The alternatives screening analysis is largely governed by what CEQA terms the "rule of reason," meaning that the analysis should remain focused, not on every possible eventuality, but rather on the alternatives necessary

1 The Antelope Transmission Project, which provides 700 MW of transmission capacity, is comprised of three segments: Segment 1 or the Antelope Transmission Project (SCH No. 2005061161) and the Segments 2 & 3 of the Antelope Transmission Project (SCH No. 2006041160) were previously analyzed and approved by the CPUC and Forest Service (Segment 1 only).

2 FERC Order No. 2003 requires all public utilities that own, control or operate facilities for transmitting electric energy in interstate commerce to provide interconnection service to electric generating facilities having a capacity of more than 20 megawatts.

to permit a reasoned choice. Furthermore, of the alternatives identified, the EIR is expected to fully analyze those alternatives that are feasible, while still meeting most of the project objectives.

According to the State CEQA Guidelines (§15126.6(f)(1)), the factors that may be taken into account when addressing the feasibility of alternatives to determine the range of alternatives to be evaluated in the EIR include: site suitability; economic viability; availability of infrastructure; general plan consistency; other plans or other regulatory limitations; jurisdictional boundaries; and whether the proponent can reasonably acquire, control or otherwise have access to an alternative site. For the screening analysis, the feasibility of potential alternatives was assessed taking the following factors into consideration:

- **Economic Feasibility.** Is the alternative so costly that implementation would be prohibitive?
- **Environmental Feasibility.** Would implementation of the alternative cause substantially greater environmental damage than the Modified Project, thereby making the alternative clearly inferior from an environmental standpoint?
- **Legal Feasibility.** Do legal protections on lands preclude or substantially limit the feasibility of permitting a high-voltage T/L? Do regulatory restrictions substantially limit the feasibility or successful permitting of a high-voltage T/L? Is the alternative consistent with regulatory and reliability standards for transmission system design, operation, and maintenance?
- **Social Feasibility.** Would the alternative cause significant damage to the socioeconomic structure of the community and be inconsistent with important community values and needs?
- **Technical Feasibility.** Is the alternative feasible from a technological perspective, considering available technology? Are there any construction, operation, or maintenance constraints that cannot be overcome?

For the screening analysis, the economic, environmental, legal, social, and technological feasibility of potential alternatives was assessed. The assessment was directed toward reverse reason; that is, a determination was made as to whether there was anything about the alternative that would be infeasible on economic, environmental, legal, social, and technological grounds.

Potential to Eliminate Significant Environmental Effects

A key CEQA requirement for an alternative is that it must have the potential to "avoid or substantially lessen any of the significant effects of the project" (State CEQA Guidelines §15126.6(a)). If an alternative is identified that clearly does not have the potential to provide an overall environmental advantage as compared to the Modified Project, it is usually eliminated from further consideration. At the screening stage, it is not possible to evaluate all of the impacts of the alternatives in comparison to the Modified Project with absolute certainty, nor is it possible to quantify impacts. However, it is possible to identify elements of an alternative that are likely to be the sources of impact and to relate them, to the extent possible, to general conditions in the subject area.

Table 2.4-1 presents a summary of the preliminary analysis of potential significant effects of the Modified Project, which is limited to those issue/resource areas carried forward for analysis in this SEIR/SEIS. Other issue/resources areas were not carried forward as they did not have the potential to result in new significant impacts or increase the severity of previously identified significant impacts (see Section 1.5.2). The impacts identified were used to determine whether an alternative met the CEQA requirement to reduce or avoid significant effects of the Modified Project.

Table 2.4-1. Summary of Preliminary Analysis of Significant Impacts of the Modified Project

Issue Area	Impact
Air Quality	Construction would result in short-term impacts to ambient air quality, potentially violating the South Coast Air Quality Management District and Antelope Valley Air Quality Management District ambient air quality standards. *Additional air quality emissions would be generated compared to the Approved Project resulting from installation of marker balls, primarily expected from helicopter use, and installation of FAA lighting.*

Table 2.4-1. Summary of Preliminary Analysis of Significant Impacts of the Modified Project

Issue Area	Impact
Biological Resources	Impacts on avian species – *FAA lighting would potentially increase this impact compared to the Approved Project by attracting or disorienting night-migrating birds*
Noise	Short-term noise from construction activity on sensitive land uses – *Increased compared to Approved Project due to additional helicopter use and construction activities to install marker balls and FAA lighting*
Visual Resources	Existing visual character and quality of the site and its surroundings would be substantially degraded – *Increased compared to Approved Project due to addition of marker balls and FAA lighting*
	Project elements result in light or glare that would adversely affect day or nighttime views – *Increased compared to Approved Project due to addition of FAA lighting on transmission structures*
	Scenic Resources within a Scenic Highway viewshed or national scenic trail would be substantially impacted – *Increased compared to the Approved Project due to the addition of marker balls and FAA lighting*
	Inconsistent with established visual resources management plans or landscape conservation plans – *Increased due to greater inconsistencies with the Forest Plan: Standard S9 regarding SIOs, and Puente Hills Landfill Native Habitat Preservation Authority Resource Management Plan.*

2.4.1.2 NEPA

According to the Council on Environmental Quality's (CEQ) NEPA Regulations (40 CFR 1502.14), an EIS must present the environmental impacts of the proposed action and alternatives in comparative form, defining the issues and providing a clear basis for choice by decision makers and the public. The alternatives discussion shall:

a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.

b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

c) Include reasonable alternatives not within the jurisdiction of the lead agency.

d) Include the alternative of no action.

e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference.

f) Include appropriate mitigation measures not already included in the proposed action or alternatives.

The CEQ has stated that "[r]easonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense rather than simply desirable from the standpoint of the applicant" (CEQ, 1983). In addition, as stated in 40 CFR 1502.1 (Purpose), an EIS "shall inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment."

In order to comply with NEPA's requirements, each alternative that has been suggested or developed for this SEIR/SEIS has been evaluated using the following:

- Does the alternative meet the statement of purpose and need?
- Is the alternative feasible?
- Does the alternative avoid or minimize adverse impacts or enhance the quality of the human environment?

Consistency with Purpose and Need

CEQA (State CEQA Guidelines §15124(b)) and NEPA (40 CFR 1502.13) both explain that an agency's statement of objectives or purpose and need should describe the underlying purpose of the proposed project and reasons to which an agency is responding. For the Project, the objectives or purpose and need, are described in Section 2.4.1.1, above. As noted in the findings for *Natural Resources Defense Council v. Morton* (458 F.2d 827 [D.C. Cir. 1972]), "Nor is it appropriate to disregard alternatives merely because they do not offer a complete solution to the problem."

Feasibility

The environmental consequences of the alternatives, including the proposed action, are to be discussed in the EIS per CEQ NEPA Regulations (40 CFR 1502.16). The discussion shall include "Possible conflicts between the proposed action and the objectives of federal, regional, State, and local land use plans, policies and controls for the area concerned." Other feasibility factors to be considered may include cost, logistics, technology, and social, environmental, and legal factors. The feasibility factors are substantially the same as described for CEQA in Section 2.3.1.2, above.

2.4.2 Alternatives Considered but Eliminated

During the scoping process agencies, organizations, and interested parties were consulted to determine a range of alternatives to consider, as opposed to implementing the Modified Project. Based on this process, only one alternative, other than the No Project Modifications/No Action Alternative, was considered, as discussed below. Alternatives were assessed for their ability to reasonably achieve the project objectives/purpose and need and reduce the significant environmental impacts of the Modified Project. Also, their economic, environmental, legal, social, and technological feasibility was evaluated. Based on these screening criteria, a determination was made as to whether the alternative would be carried forward for analysis in this SEIR/SEIS or eliminated from further consideration. The rationale for elimination is also summarized below.

2.4.2.1 Reduced Structure Height Alternative

This alternative would re-design the Approved Project's transmission structures such that the overall height of the structures would be reduced to minimize the need for FAA marker balls and aviation lights, to the extent feasible. To maintain the ground clearance requirements of CPUC GO 95, a greater number of transmission structures would be required along the Project alignment. However, in some instances, such as in mountainous terrain, reduced heights may not be feasible and FAA marker balls and lights would continue to be recommended.

Consideration of CEQA/NEPA Criteria

Project Objectives/Purpose and Need. This alternative would provide the electrical facilities necessary to reliably interconnect and integrate up to 4,500 MW of new wind generation in the TWRA, thereby enabling SCE and other California utilities to comply with the California Renewables Portfolio Standard. It would also meet projected load growth in the Antelope Valley and would address South of Lugo transmission constraints.

Feasibility. No feasibility issues have been identified. This alternative would be feasible to construct and operate.

Environmental Advantages. Under this alternative the transmission structures would be designed to be shorter in height such that fewer instances would occur where the FAA would recommend the need to install marker balls and lights. As such, the long-term significant and unavoidable visual impacts associated with the marker balls and lights under the Modified Project would be avoided to the extent feasible.

Environmental Disadvantages. This alternative would require the installation of substantially more transmission structures than the Modified Project in order to maintain GO 95 ground clearance requirements. The installation of more transmission structures would result in greater impacts during construction due to greater ground disturbance and overall construction requirements, including more equipment, materials, and traffic (ground and aerial). As such, short-term construction impacts would be greater than the Modified Project, especially with respect to air quality, biological resources, cultural resources, environmental contamination and hazards, geology/soils, hydrology/water quality (erosion), and noise.

Alternative Conclusion

ELIMINATED. This alternative would meet the purpose and need of the TRTP and would be feasible, although not in areas of extreme topography such as portions of the ANF. However, construction of this alternative would result in substantially greater environmental impacts during construction due to the added ground disturbance. As such, this alternative offers no environmental advantage over the Modified Project without creating greater impacts of its own. Therefore, the Reduced Structure Height Alternative has been eliminated from further consideration.

2.4.3 CEQA Environmentally Superior Alternative

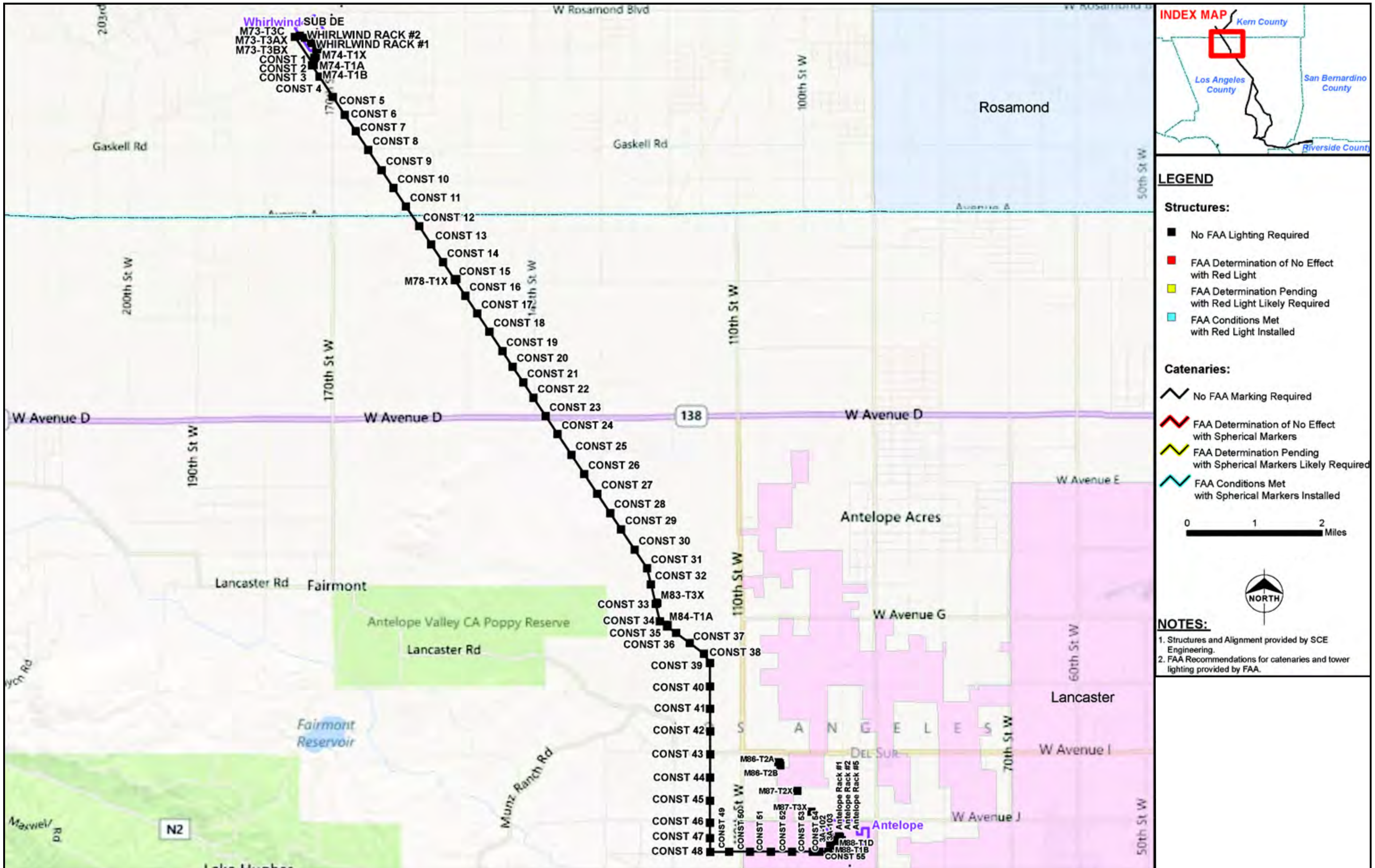
In accordance with CEQA requirements, an “environmentally superior alternative” must be identified among the alternatives analyzed in an EIR. The environmentally superior alternative is the alternative found to have an overall environmental advantage compared to the other alternatives based on the impact analysis in the EIR. If the environmentally superior alternative is the No Project Alternative, State CEQA Guidelines §15126.6(e)(2) requires the EIR to identify an environmentally superior alternative from among the other alternatives.

As described in Section 2.4.2, the only alternatives to the Modified Project that were considered include: (1) Reduced Structure Height Alternative and (2) the No Project Modifications/No Action Alternative (i.e., the Approved Project). The Reduced Structure Height Alternative was eliminated from consideration as it would result in substantially greater environmental impacts during construction due to the added ground disturbance. The No Project Modifications/No Action Alternative would reduce the new significant visual impacts resulting from the addition of marker balls and lights associated with the Modified Project, but would not comply with FAA safety recommendations resulting in potential safety impacts to aviation. As such, while the No Project Modifications/No Action Alternative could be considered environmentally superior from the perspective of the natural environment, it would not meet the FAA’s safety recommendations which would provide for increased aviation safety by making hazardous structures (transmission structures and wire spans) more visible to pilots. Furthermore, CEQA requires that an EIR identify the environmentally superior alternative from among the other alternatives when the No Project Alternative is the environmentally superior alternative. Therefore, the environmentally superior alternative would be the Modified Project.

2.4.4 NEPA Lead Agency Preferred Alternative

The “preferred alternative” is a preliminary indication of the federal responsible official’s preference of action, which is chosen from among the Modified Project (i.e., proposed project) and alternatives. The preferred alternative may be selected for a variety of reasons (such as the priorities of the particular lead agency) in addition to the environmental considerations discussed in the EIS. For the Project, the federal responsible official is the Forest Supervisor of the ANF. At this time, in accordance with NEPA (40 CFR 1502.14(e)), the Forest Supervisor has not identified a preferred alternative. As such, the preferred alternative will be identified in the Final SEIR/SEIS.

In addition to the preferred alternative, the federal responsible official, or federal lead agency, is also required to identify an "environmentally preferable alternative" in the ROD for the EIS (40 CFR 1505.2(b)). In contrast with the preferred alternative, the environmentally preferable alternative is the alternative that will promote the National Environmental Policy Act as expressed in NEPA's Section 101. Typically, this is the alternative that would cause the least environmental damage as well as preserve natural resources related to cultural and historical values. Therefore, the preferred alternative identified in the Final SEIR/SEIS may not be the same as the environmentally preferable alternative identified in the ROD. As with the CEQA environmentally superior alternative, the NEPA environmentally preferable alternative is subject to all mitigation measures applicable to NFS lands identified for the Approved Project and any additional mitigation measures identified in Chapter 4 (Affected Environment and Environmental Consequences) of this SEIR/SEIS.



Source: SCE, 2012c.

Figure 2.1-1a

FAA Tower Lighting and Catenary Recommendations-Segment 4

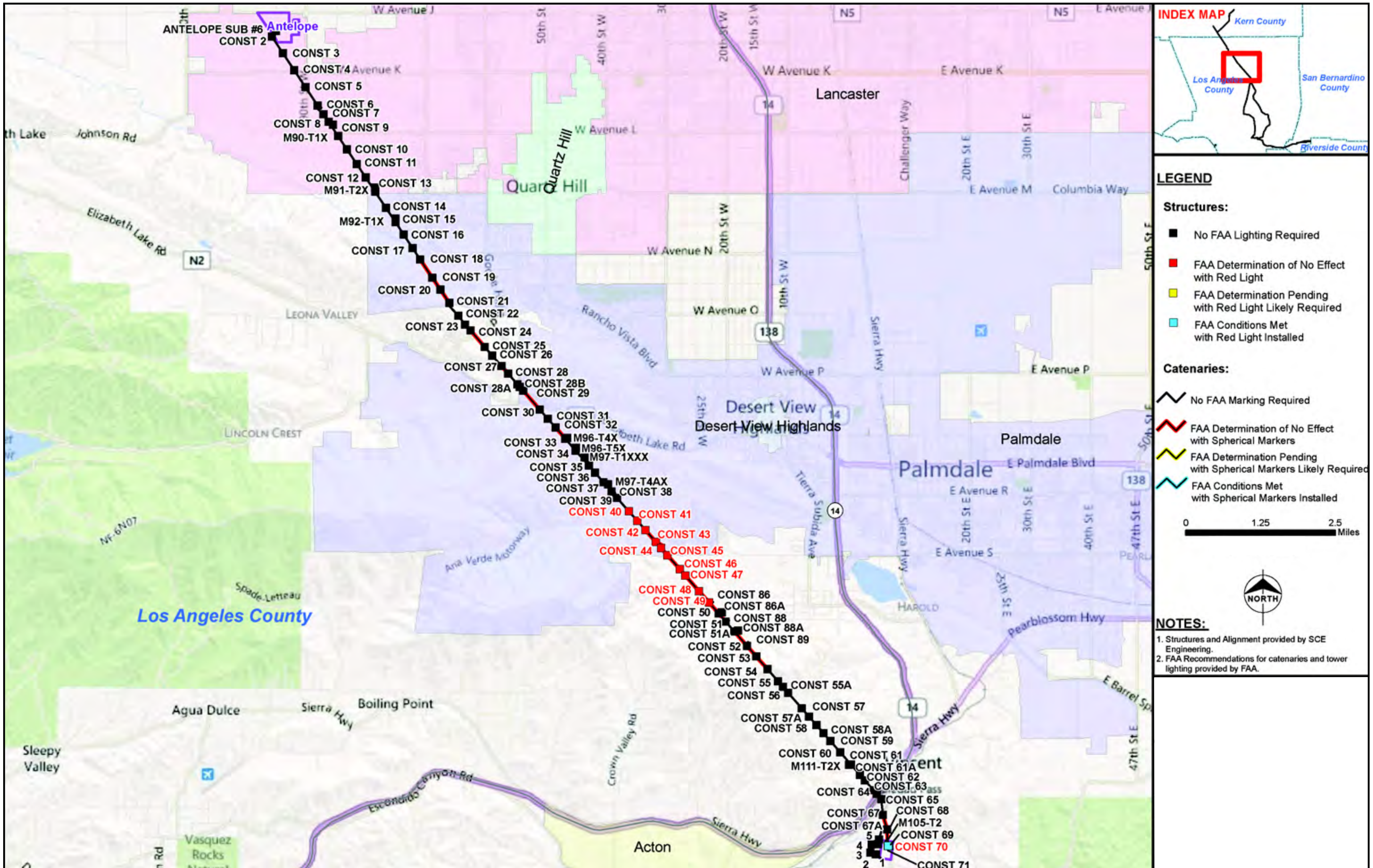
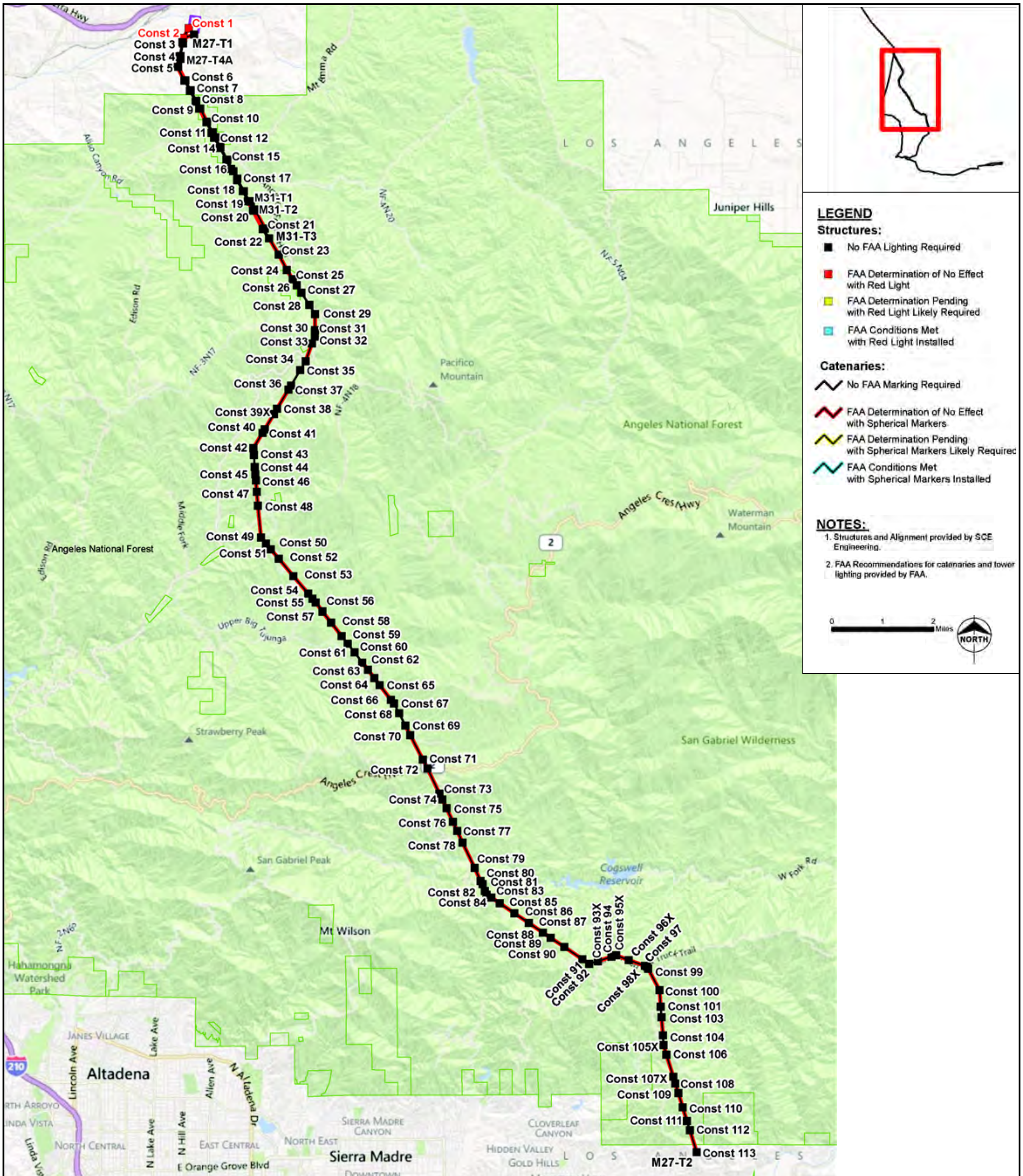


Figure 2.1-1b
FAA Tower Lighting and Catenary Recommendations-Segment 5

Aspen Environmental Group

Source: SCE, 2012c.



Aspen Environmental Group

Source: SCE, 2012c.

Figure 2.1-1c

FAA Tower Lighting and Catenary Recommendations-Segment 6

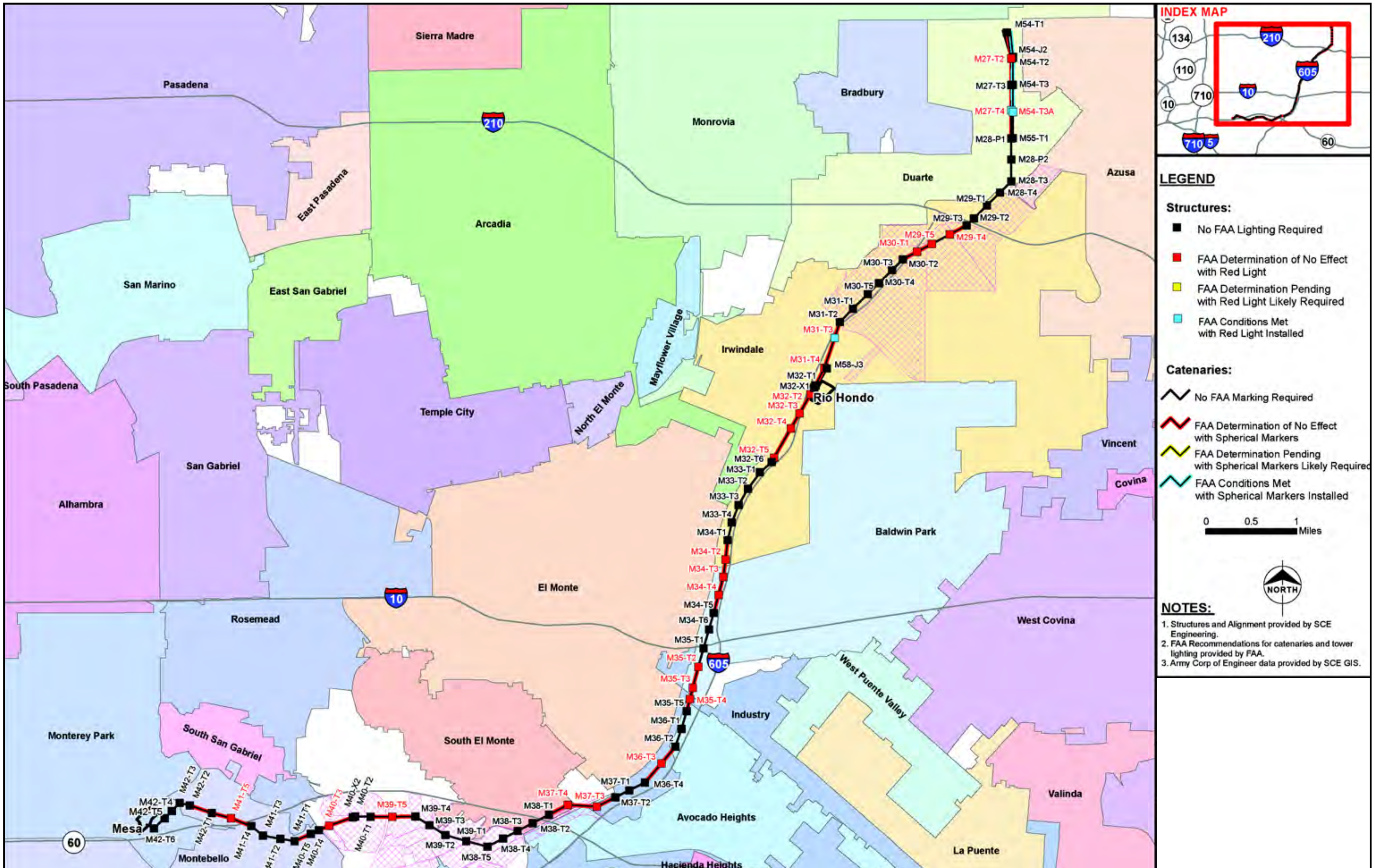
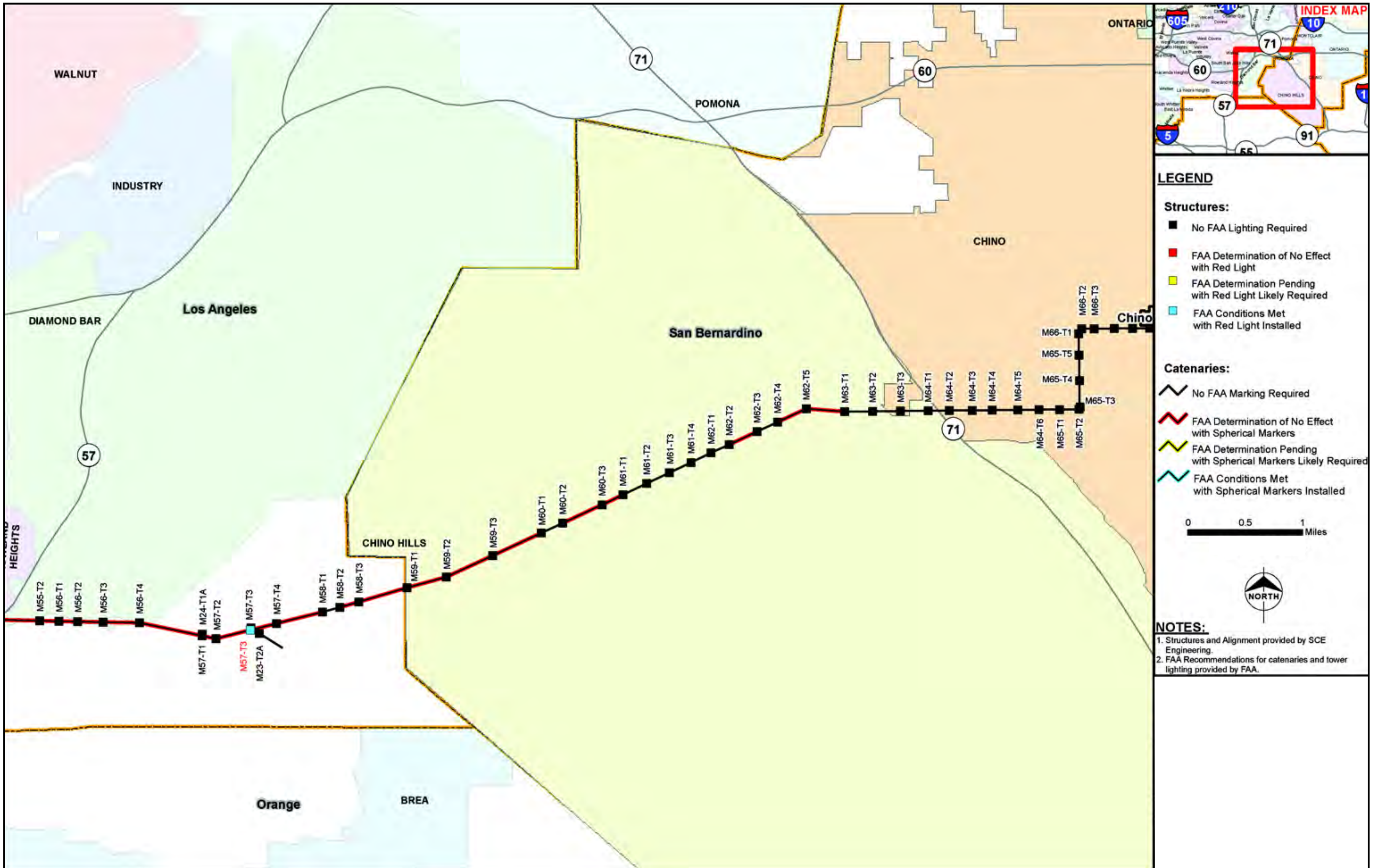


Figure 2.1-1d

FAA Tower Lighting and Catenary Recommendations-Segment 7

Aspen Environmental Group

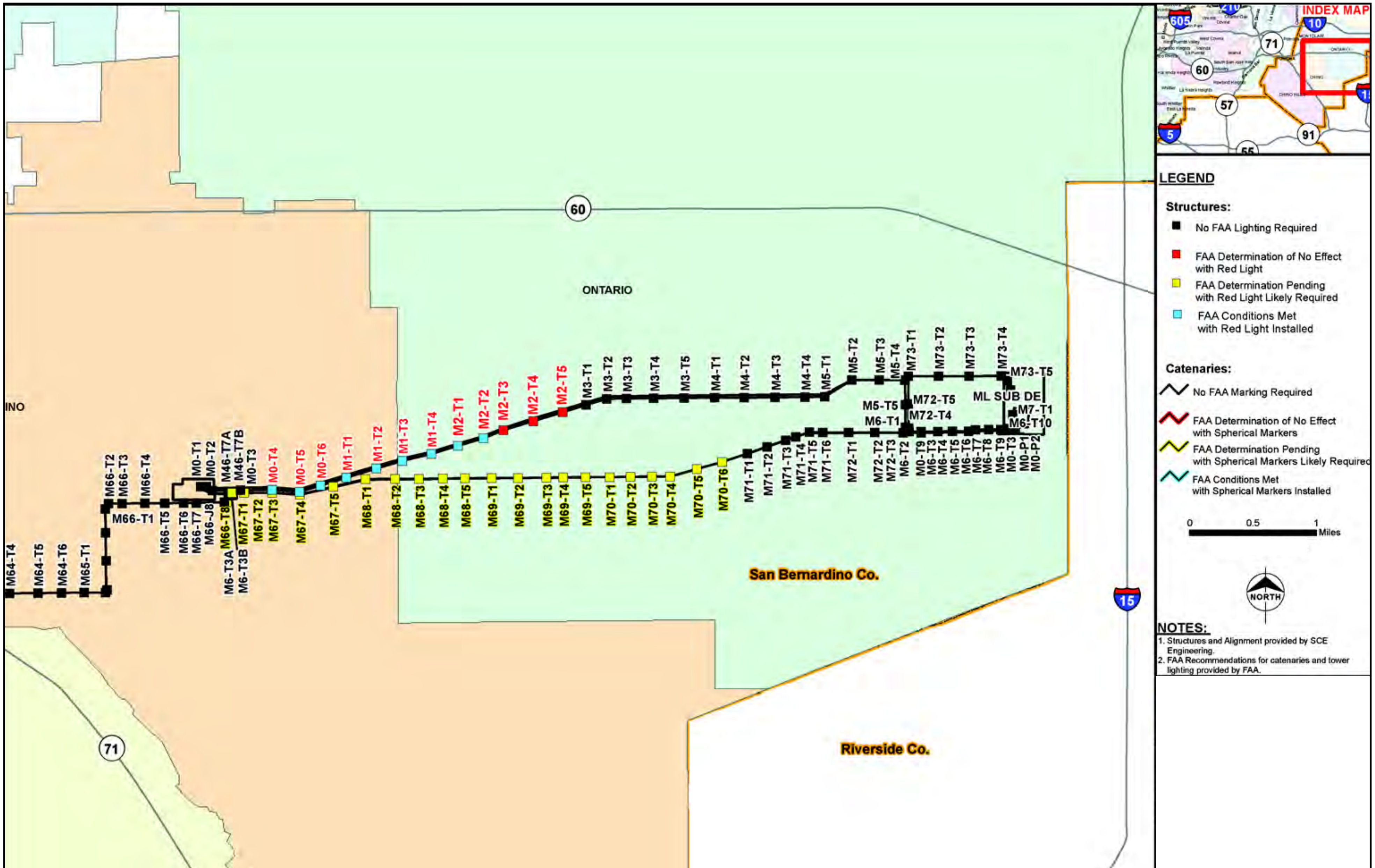
Source: SCE, 2012c.



Source: SCE, 2012c.

Figure 2.1-1e

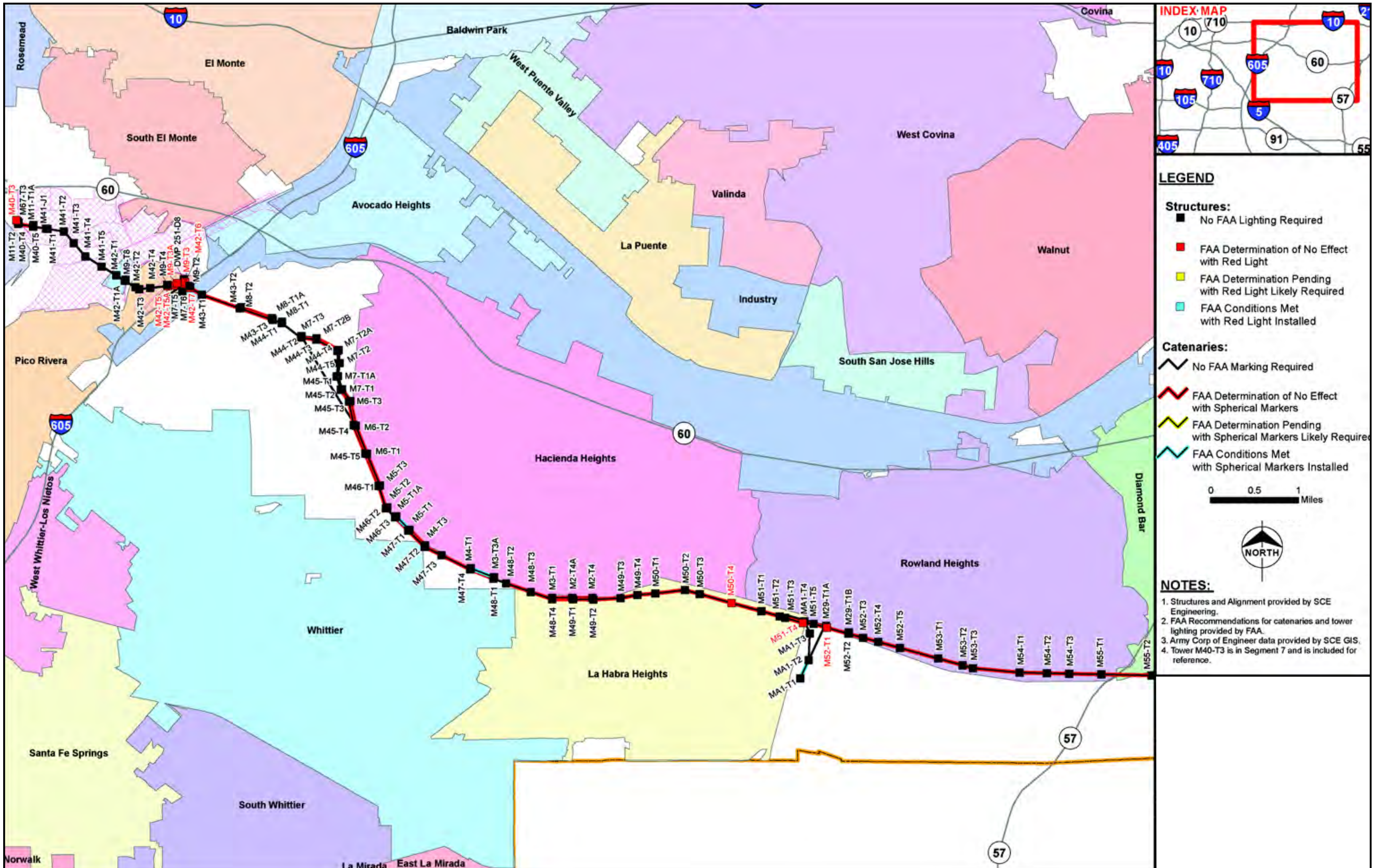
FAA Tower Lighting and Catenary Recommendations-Segment 8, Phase 1



Source: SCE, 2012c.

Figure 2.1-1f

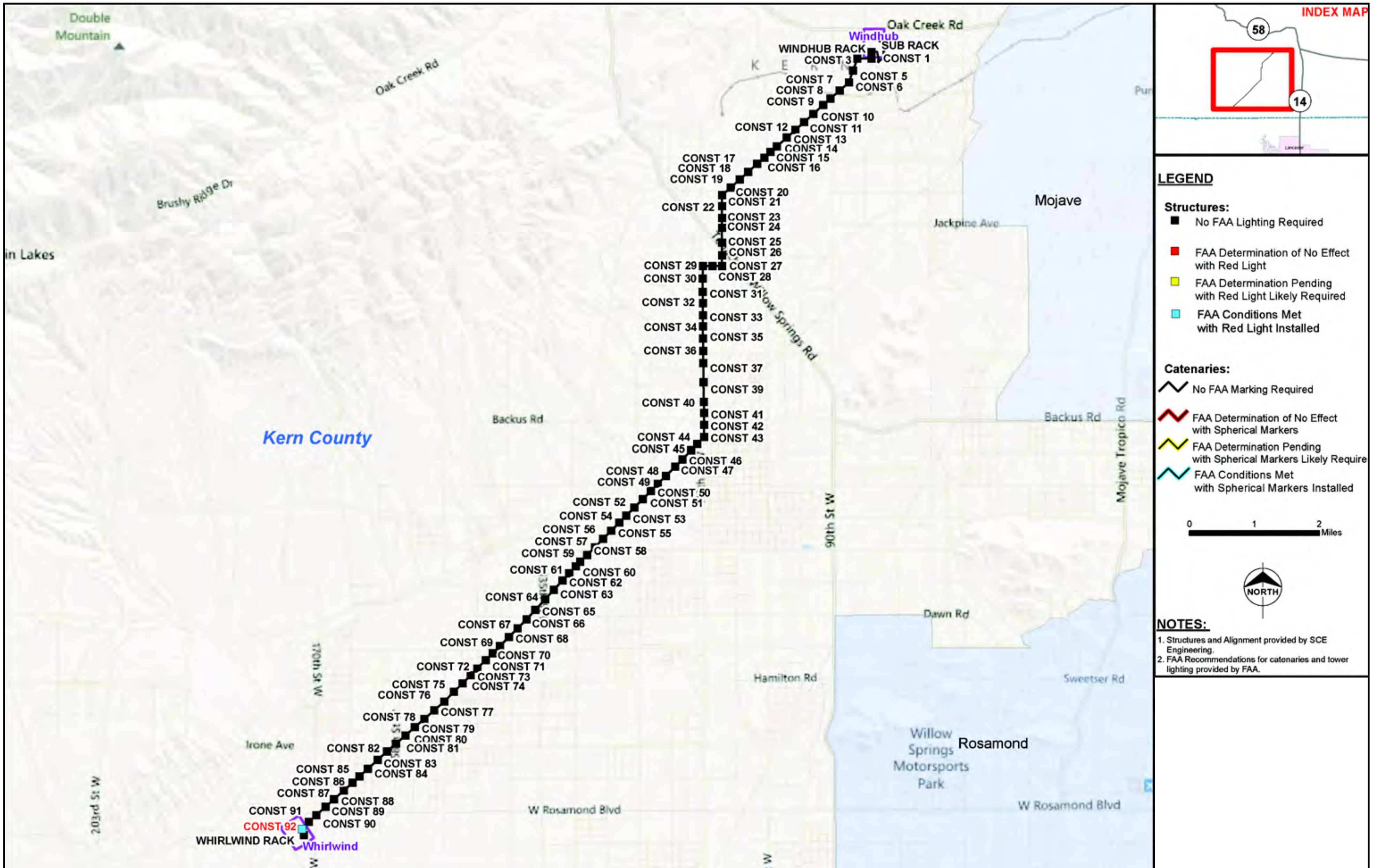
FAA Tower Lighting and Catenary Recommendations-Segment 8, Phase 2/3



Source: SCE, 2012c.

Figure 2.1-1g

FAA Tower Lighting and Catenary Recommendations- Segment 8, Phase 4

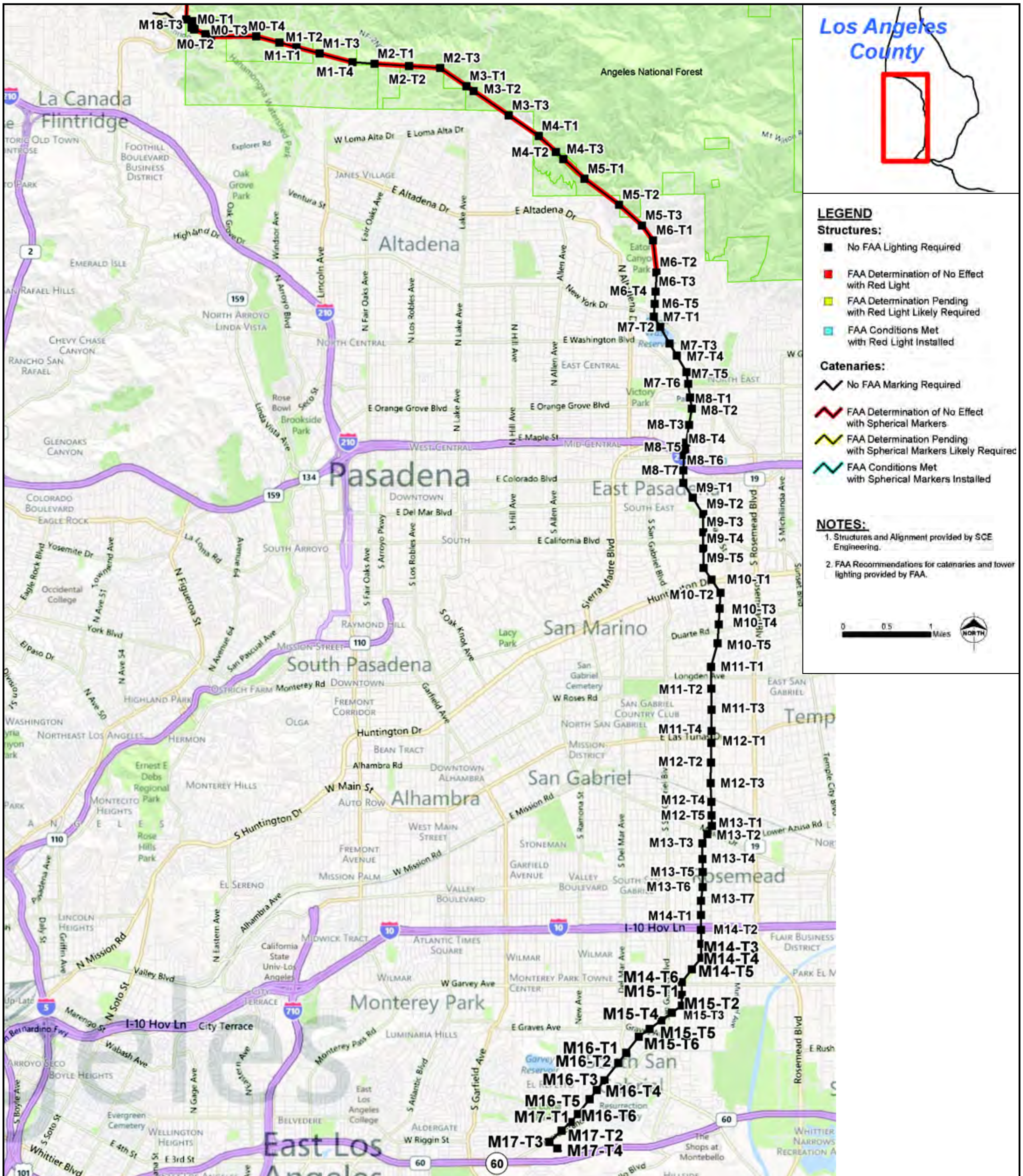


Aspen Environmental Group

Source: SCE, 2012c.

Figure 2.1-1h

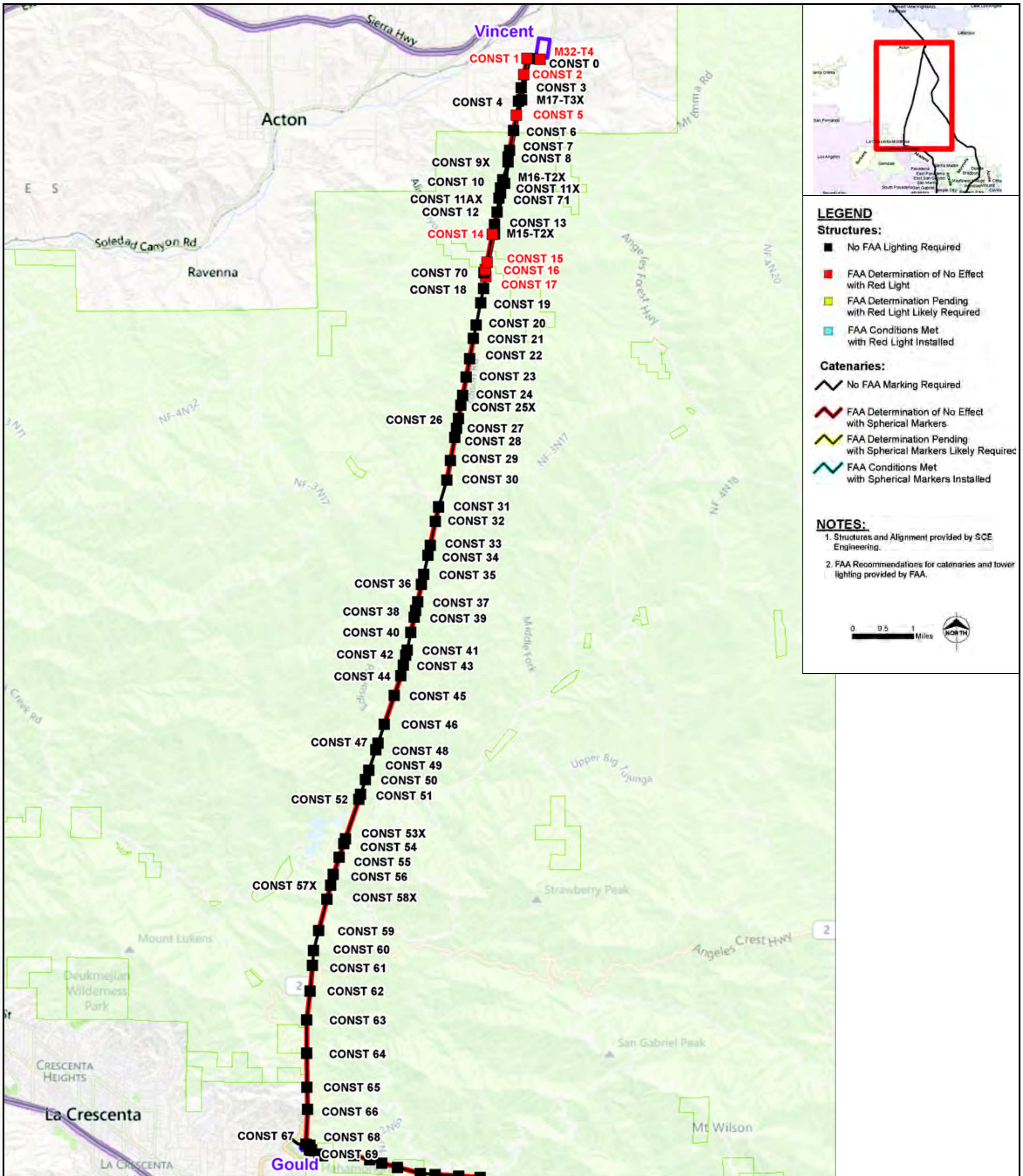
FAA Tower Lighting and Catenary Recommendations-Segment 10



Source: SCE, 2012c.

Figure 2.1-1i

FAA Tower Lighting and Catenary Recommendations-Segment 11 - Gould to Mesa



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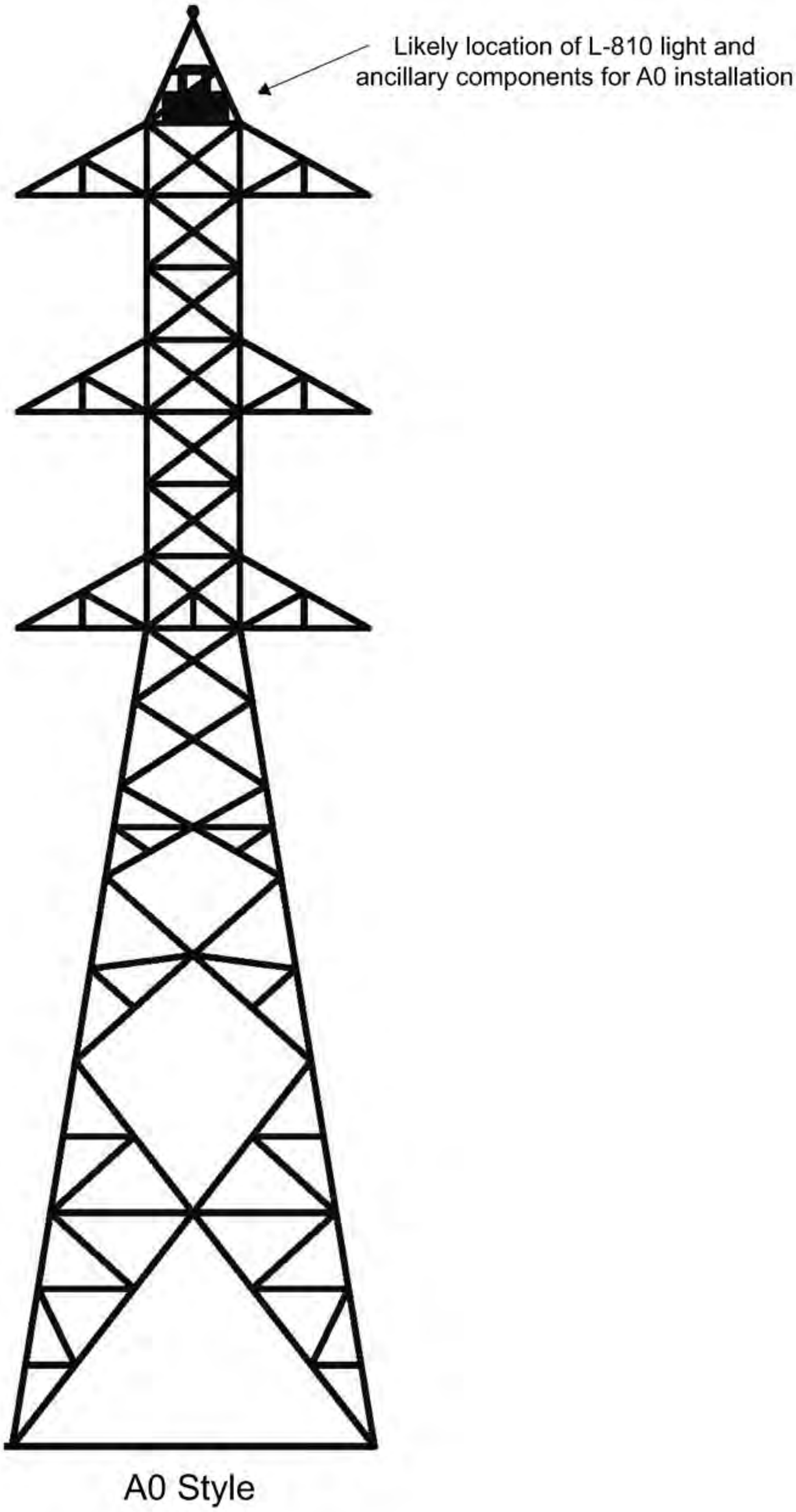
Source: SCE, 2012c.

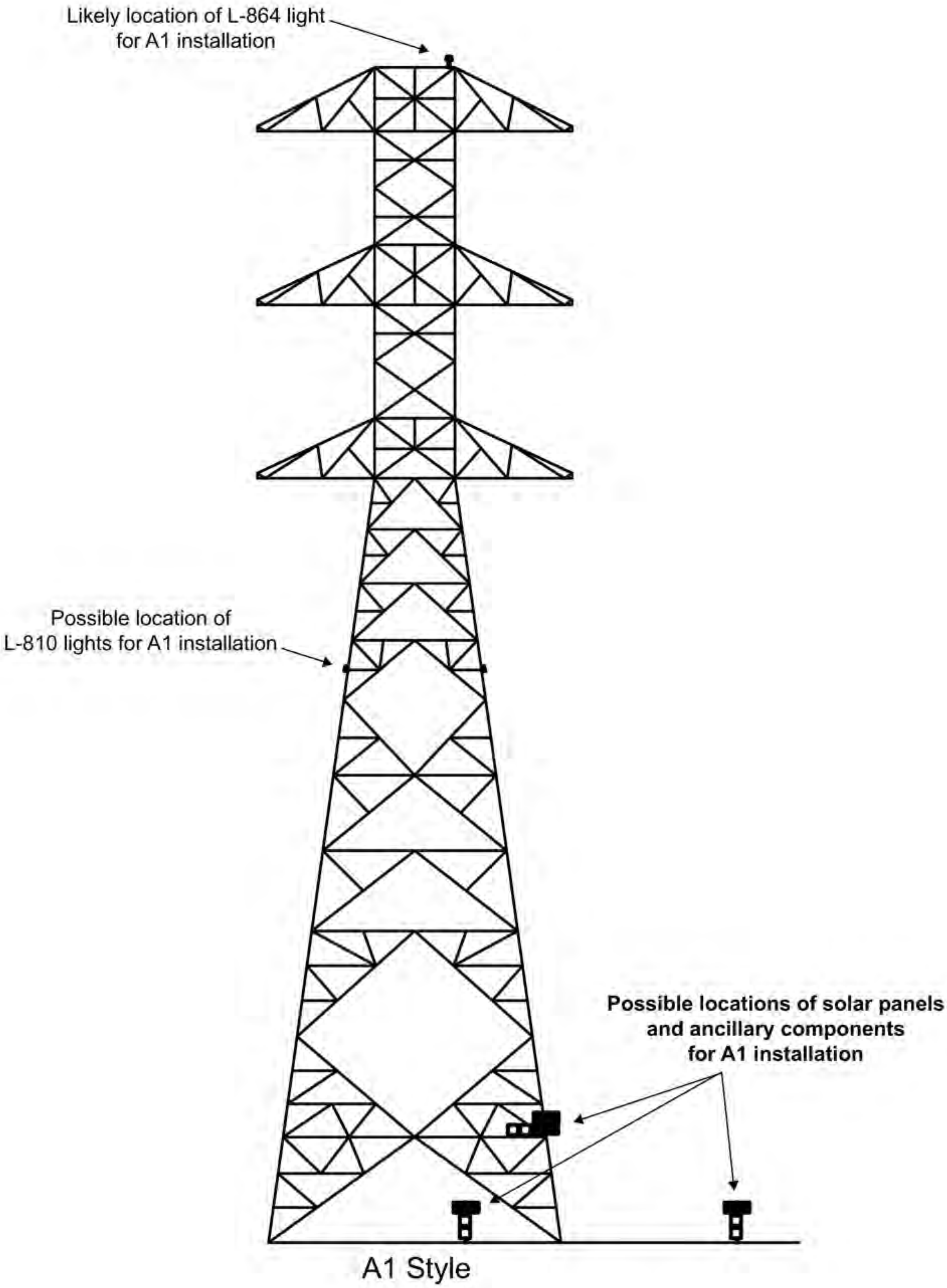
Figure 2.1-1j

FAA Tower Lighting and Catenary Recommendations- Segment 11 - Vincent to Gould



Source: SCE, 2011 (Project Modification Report)

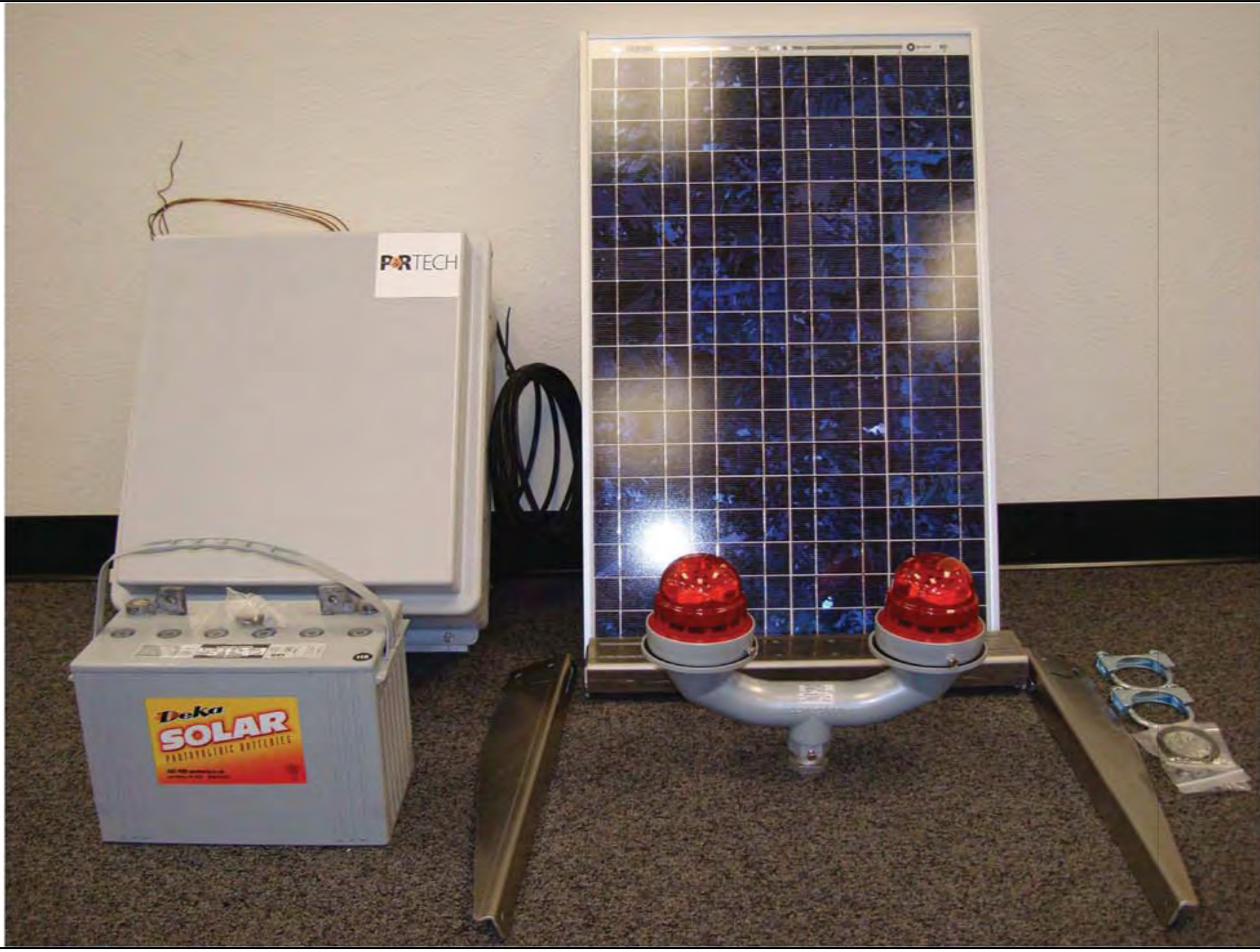
Figure 2.3-1
Possible A0 Lighting Installation Configuration



Source: SCE, 2011 (Project Modification Report)

Figure 2.3-2

Possible A1 Lighting Installation Configuration



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Source: SCE, 2011 (Project Modification Report)

Figure 2.3-3
Components for Solar Power Installation (A0 Lighting Installation)

a. Existing installation of a ground-based pole with supporting peripheral solar hardware.

b. Existing installation of a solar powered lighting system on a transmission structure.

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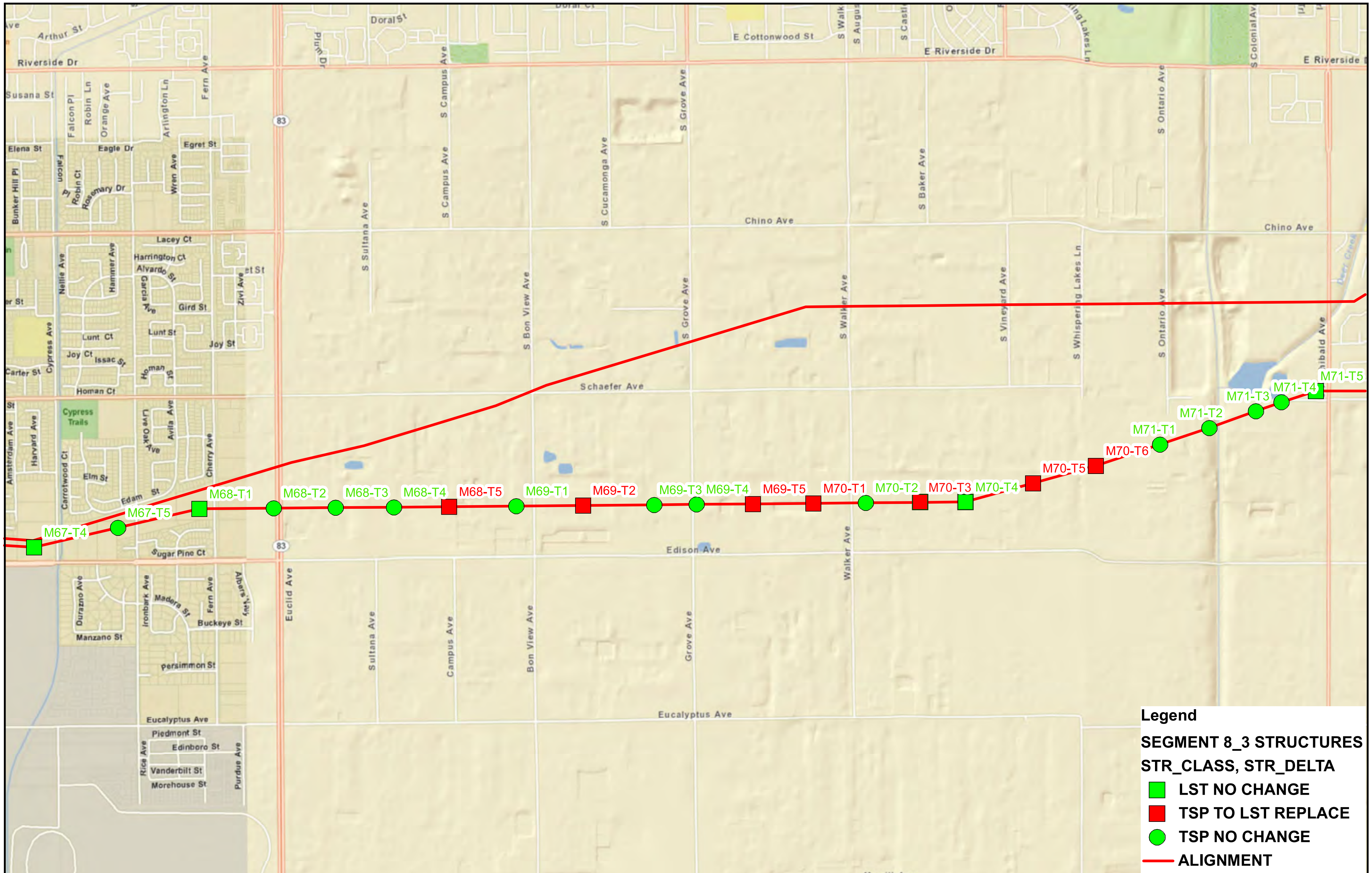
Source: SCE, 2013.

Figure 2.3-4

Solar Power Installation Examples



Source: SCE, 2011a

Figure 2.5-1

Segment 8, Phase 3 Structure Modifications

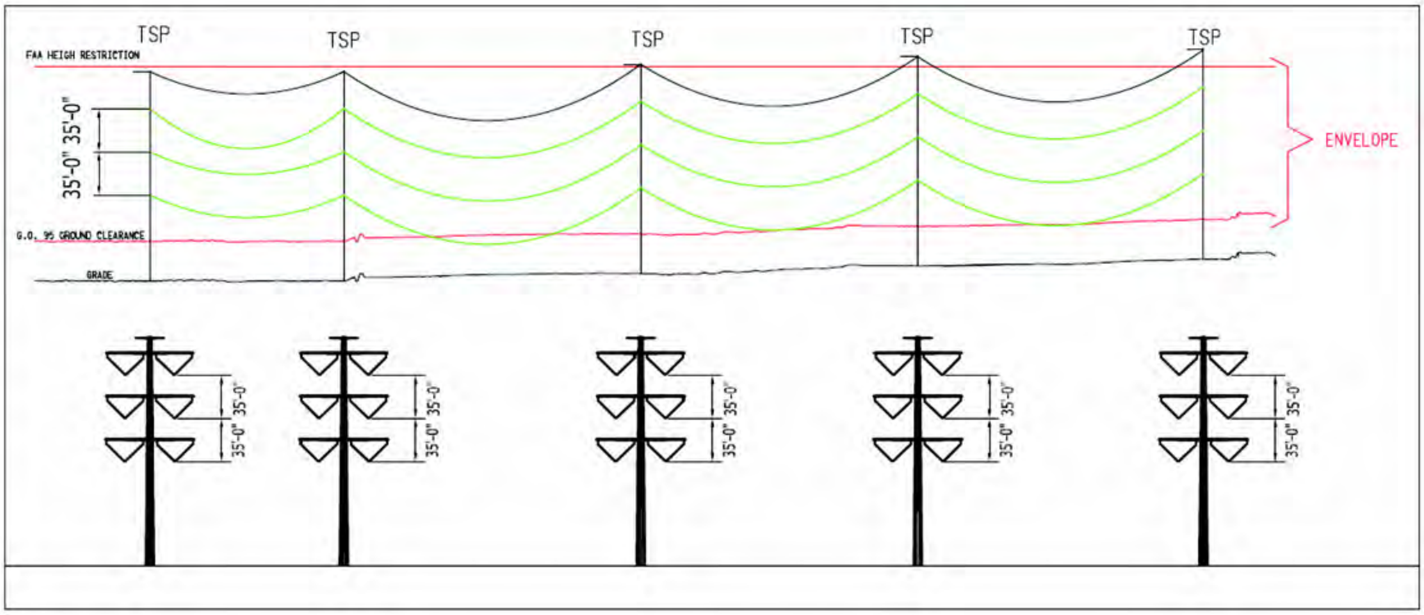


Figure A: Original Segment 8, Phase 3 Design

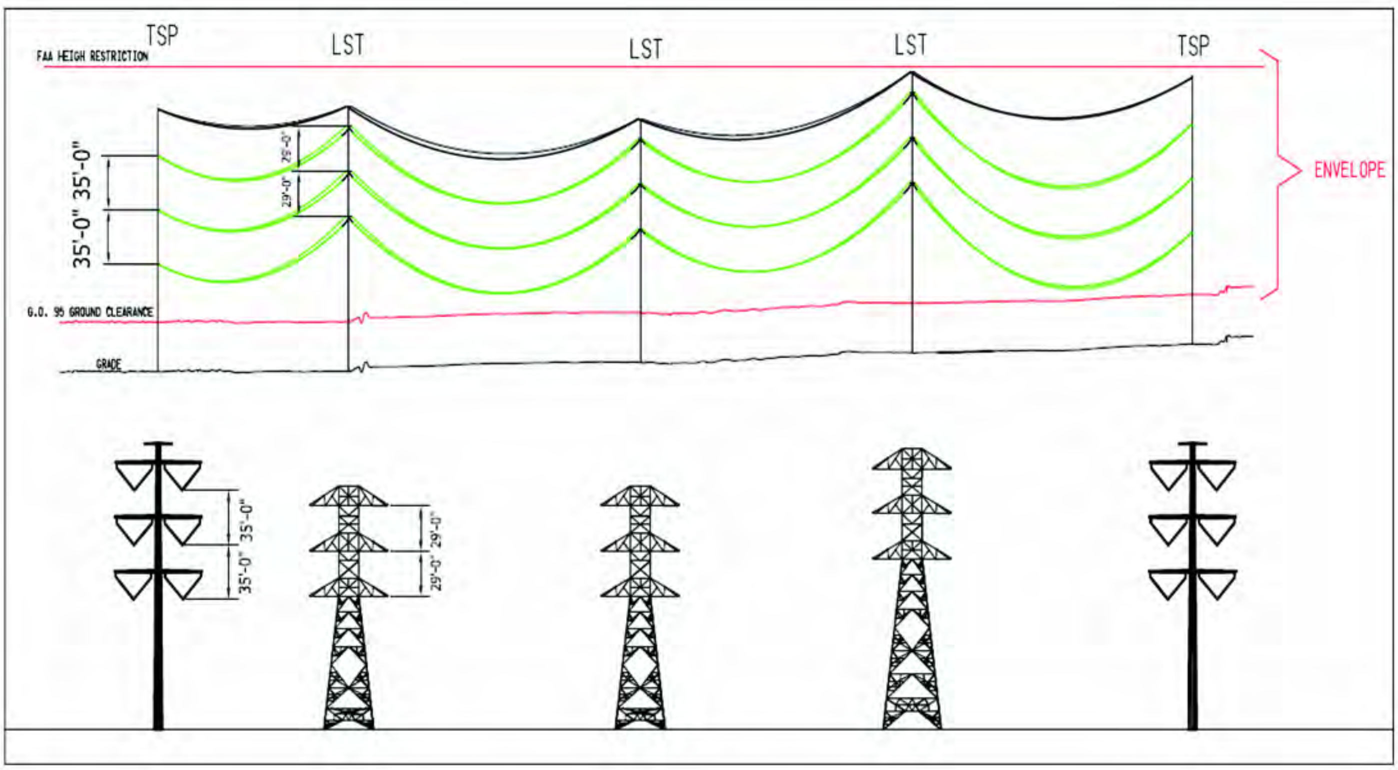


Figure B: Modified Segment 8, Phase 3 Design Using Reduced Phasing LSTs

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Source: SCE, 2011 (Project Modification Report)

Figure 2.5-2

Original and Modified Segment 8, Phase 3 Tower Design - Conductor Clearance